The
Electrical Review

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Electricity and the Countrywoman

FOR many years ahead the chief use for electricity in rural areas will be found in the farmhouse itself. The load will be primarily a domestic one and will thus provide a field in which the help of women will be of especial value to the industry. We therefore welcome the importance attached to rural electrification by the Electrical Association for Women, as indicated by the two papers read on the subject at the conference now being held in Birmingham.

The inhabitants of the countryside are generally believed to be less prone to adopt new methods than are urban communities, partly due to more conservative traditions and partly to the prevalence of different financial standards. They are less likely to adopt anything in the nature of a luxury; its basic utilitarian value must be proved. That is why we liked Mr. J. T. H. Legge's variant from the usual formula of supplying at "a price that everybody can afford to pay" to "a price at which they cannot afford to be without it."

Electrical service is generally of greater drudgery-saving value in the country than in the town, where there may be more competition from other methods. This of itself, we believe, does not justify enhanced rates for heating and cooking, as there is an important competitor in "doing without," to which the rural dweller has long accustomed himself.

Another note that we liked in Mr. Legge's address was his deprecation of any tendency to regard the benefits of electricity as belonging to some remote future. He was able to demonstrate from experience in one area only the striking advances that have recently taken place. And there are many other areas in which rural electrification shows remarkable developments with the aid of attractive tariffs, wiring schemes, simple hire of apparatus, and prompt service.

Apart from the important contribution made by well-trained demonstrators, women, through their institutes and otherwise, can do much to influence the public mind in favour of electricity, thus cheapening its cost through increased use and through awakening a general appreciation of the necessity of wayleave facilities on reasonable terms if electricity is to be really cheap.

Like Miss Nissen, who told us of the excellent work done by women in making the Norwegian public electrically minded, Mr. Legge realises the need for teaching the young the value of electricity in the home and how to use apparatus to the best advantage. Reliability of apparatus is especially desirable in places where skilled assistance is not readily obtained. We recently referred to the legal requirement in Canada that all apparatus should be approved by a central body. A committee set up to the same end (and including women members) by the Association of Norwegian Power Plants, Miss Nissen stated, has been most successful in raising the standard of domestic apparatus, and in this it has received the keen support of the manufacturers.

While our primary concern is to encourage the use of electricity and electrical appliances to the fullest possible extent everywhere, we must also recognise the wider social significance of the effort of the E.A.W. to improve the working conditions of the countrywoman.

Electrical Leadership

QUESTIONS are some times raised regarding the women's electrical movement which should not, and cannot, be ignored when the whole trend of electricity supply development is being subjected to close scrutiny. If it be generally accepted that we all want to increase the demand for electricity as rapidly as possible, critical questionings will be a help and not a hindrance. Some points have already been mentioned in our "Correspondence" pages, but there are others that are spoken rather than written. For instance, shall we sell more electricity and secure larger additions to consumers by attaching exaggerated importance to such matters as social standing, rather than electrical knowledge, when choosing influential leaders? This question is not only asked regarding women's activities, it has a bearing also on the future of electrical propaganda and publicity. We shall do well to consider during the processes of reorganisation

whether great names necessarily go so far as other qualifications to achieve great results in such a specialised case. But reverting to the women's movement we have pleasure in congratulating Mrs. Hutchinson, the wife of the borough electrical engineer of Farnworth, on the zeal that she has shown in securing members for the E.A.W. in her husband's area. To-day at Birmingham she is to receive the president's cup for her achievement. There are engineers whose hands hang down and whose hopes have dried up for very dread of becoming "mere distributors." Let them show our "Personal" pages to-day to their wives—if they have them—and see one reason why the Farnworth borough engineer is so contented with his lot!

Scientific Investigation

SIR FRANK SMITH, in his discourse on "The Travel of Wireless Waves," which formed the subject of the 24th I.E.E. Kelvin Lecture, brought out clearly the interdependence of various branches of science in providing the "raw material" of applied electricity. A legitimate deduction is the immense field open to the experimenter who refuses to allow the mathematician to dictate his conclusions (and is surprised perhaps by the results) but who uses mathematics as an indispensable tool. Indeed, the scope of the empiricist increases with the advance of science, though its field tends to be shifted from the applications of discovery to the original investigations. Cathode-ray oscillography has been an essential factor in making the measurements upon which Sir Frank's lecture was based, and last week we reviewed an important publication on the subject by the Department of Scientific and Industrial Research. With regard to the financial side, the grant of £250 made by the I.E.E. for the investigation of polar phenomena at the instance of Professor E. V. Appleton has yielded results quite disproportionately great to the expenditure.

The Milch Cow

WE have often condemned the pernicious practice adopted by some municipal authorities of taking large amounts from the profits of their electricity undertakings for the relief of rates. We now learn that a rather astounding extension of this practice is proposed by the South Shields Corporation. The proposal is to take no less than £20,000 from the *reserves* of its undertaking to enable the local rate to be reduced by a shilling in the pound. A protest has been made to the Electricity Commissioners who question the legality of the Corporation's action, and have asked a deputation to meet them to discuss the matter.

The Strong Man

ON the whole a very successful record stands to the credit of municipalisation of electrical undertakings in Britain, but the system has inherent defects which now and again reveal themselves somewhat painfully. It used often to be said that the lot of a borough electrical engineer was far from being a happy one unless he was a strong man who could lead his committee. He may by virtue of his strength arouse opposition in some quarters but if he knows what is the right thing he can generally get it done. The man who is surrounded by influences which weaken his authority so that he is in danger of being tossed about by every wind that blows, is destined to find life deplorable. One wonders sometimes whether the day is not far off when we may have a report and investigation of the whole question of municipal ownership and control as it bears upon the progress of the national grid.

A Tax on Turnover?

DR. C. C. GARRARD believes that the problem of unemployment in Great Britain can be cured within the next few years "without waiting for any revolution in the political system or in the motives which determine our individual conduct," and without waiting for a settlement of the international trade and American war debt questions. He tells how this can be done in a shilling pamphlet ("A Short Way with Unemployment") issued last week. He writes as an engineer in charge of a well-known electrical works employing a numerous staff of engineers, draughtsmen, workmen, and clerical assistants. He says that until recently he has not had to discharge through lack of work, men who have laboured loyally and energetically, but who, unfortunately, have not, in the majority of cases, the slightest chance, under present conditions, of securing another job. His remedy, stated briefly, is the creation of new money by means of a very moderate turnover tax. To use his closing words: "If this new money be injected into the business system by being spent on new work which will not compete nor interfere with present production, the unemployed will be gradually absorbed into industry." As the author admits, the idea of a turnover tax is not new, but he has written a thought-provoking pamphlet which electrical men will like to read as coming from one of themselves.

An Outdoor Power Station

A POWER station without buildings, busbars, or steam headers, is under consideration by the New York and Queen's Electric Light & Power Co., U.S.A., for its Astoria system. There would be nine 200,000-kW sets running as independent units with boilers having a stop-valve pressure of 1,400 lb. per sq. in., but electrically linked through the secondary windings of the nine auto-transformers connected to the alternators through switchgear. Each auto-transformer would have eight secondaries, from which the radial feeders would be tapped. The capital cost of the station is estimated at $55 (£11 3s. at par) exclusive of land and existing coal-handling plant. From data we have relating to American conditions the cost of the Astoria station if of normal design and including coal-handling plant would be about £17 per kW, as compared with £25 per kW, which appears to be the average cost of stations equivalent in size to the British station costing £13.4 per kW referred to in Mr. W. S. Burge's recent I.E.E. paper. Constructed on the lines of the Astoria station, the capital expenditure on the latter would have been about £10 5s. per kW. The technical possibilities of the outdoor power station are interesting, but the lower costs of construction in this country would make disadvantages in operation of much greater moment as a set-off against any saving in initial expenditure.

A President's Example

IF those who are in positions of electrical authority would persuade those coming within the circle of their influence to take a practical interest in the Electrical Industries Benevolent Association, there would be a big increase in the funds. Mr. R. P. Sloan, the retiring president, stated last Friday that as the result of a ten-days' personal effort he had obtained 279 applications for membership from his own staff, and there were more to come. Surely so excellent an example only has to be mentioned for it to be followed!

Apology

In our issue of the 14th April we inserted under the heading "Bankruptcy Proceedings" the following statement:—

H. F. Spence (H. F. Spence & Sons), electrical engineer, 2, Eureka Terrace, Honiton. Trustee, Mr. A. Collins, 23, Baldwin Street, Bristol.

We have now ascertained that we were in error in such statement. Mr. H. F. Spence is not a Bankrupt. We unreservedly withdraw such suggestion and apologise for its insertion, which we are informed has caused Mr. Spence considerable distress. We are pleased to give every publicity to the fact that we have made this mistake.

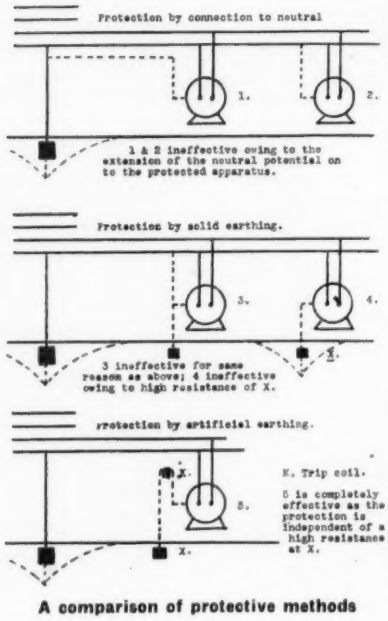
The Lighting of London's Underground

1. Wood Green station, Piccadilly Line. 2. Arnos Grove, a station of unusual design. 3 and 4. The platforms and booking hall at Arnos Grove. 5. A street direction sign at Manor House Junction. 6. The booking hall at Manor House station. 7 and 8. The interior and exterior of Sudbury Town station. 9. The entrance to the new Hyde Park Corner station.

Bare-neutral Wiring. By T. C. Gilbert

The case against its adoption

A PROPOSAL is being made in some quarters (it was even mentioned at the last E.C.A. Conference) to introduce bare-neutral wiring systems. Little damage would be done if the use of such systems were confined to urban areas, where earthing conditions are comparatively good, but disastrous results would follow their introduction into rural areas. Bare-neutral wiring systems extend the unwanted neutral potentials into all parts of the consumer's installation, to metal frameworks of buildings, fences and the like. In the sacred name of cheapness, however, it is almost certain that the use of the system would follow the introduction of multiple earthed neutrals.


Protection by connection to neutral
1.
2.
1 & 2 ineffective owing to the extension of the neutral potential on to the protected apparatus.
Protection by solid earthing.
3.
4.
3 ineffective for same reason as above; 4 ineffective owing to high resistance of X.
Protection by artificial earthing.
K. Trip coil.
5 is completely effective as the protection is independent of a high resistance at X.
5.
X.

A comparison of protective methods

The outstanding example is, of course, the attempt made by the Detroit Edison Co., of Michigan, to press the use of bare-neutral wiring systems throughout its territory. Bare-neutral services are permitted under the American National Electrical Code, and some two or three years ago several thousand interior installations with bare neutrals were made which caused considerable difficulty later. Even the Detroit Edison Co. would not face the responsibility of advocating this system for rural use.

Apparently we in this country are partly responsible for the ill-advised introduction of the bare-neutral system by the Detroit Edison Co., as following an inquiry in one district an investigating engineer reported that supply interests maintained that "it has had a long, successful and widespread use in England, where it is found cheap and safe, *and is now in good repute.*" His comment was, "This story, oft repeated, has been used to urge permission of such a practice upon other branches of the electrical industry, although reluctant and disbelieving, and upon an uninformed public." Further significant passages occur in another report, dealing with a different area where trouble with bare-neutral systems "led directly to the present complete abandonment of both requirement of bare-neutral and permission for it. Two years of the restored standard has brought general satisfaction.

In Rural Districts

Should the supply interests be successful in introducing multiple earthing, bare-neutral wiring may be considered a natural consequence "in view of its successful use in America, &c." My information is that most of the bare-neutral installations in the United States have been, or, at any rate, soon will be, rewired with insulated neutrals. Single-pole fusing and switching is another matter, and need not be confined to bare-neutral systems, but is applicable to all; it is, however, so often advanced as being the peculiar prerogative of bare-neutral systems. There are certain directions in which the cost and complications of the interior installation can be safely reduced, even in rural areas; the introduction of bare neutrals is not one of these.

With the wide electrification of the countryside now going forward or projected, voltage and current leakages will assume a greater importance, owing to the absence of the fairly adequate protection available in towns—low-resistance earthing; we do not want to repeat the experiences of the German and American authorities in the loss of cattle and horses. Animals have been killed by simply coming within the area of a potential gradient set up by a high-resistance earth whilst not in contact with any live metal.

As we cannot construct all farming apparatus of insulating material we have no option but to earth it, but this earthing must not only not be made to the neutral earth, but must be as remote from it as possible. The first step will be to see that there are no metal conduits, the wiring being carried out by means of that most suitable system, tough-rubber, or c.t.s. (with which may be included the several "ite" systems), with two insulated wires and no earthing conductor. The apparatus installed by the farmer will fall roughly under two headings, small portable apparatus used from plugs and the motors installed in the dairy and other farm buildings. I suggest that the plugs and the motors should be protected by local earthing electrodes, and not by a common earth system extending throughout the whole installation; by this means a leakage at one point cannot be extended to another and perhaps more vulnerable point, but is confined to the apparatus or motor affected. It will also have the result of keeping the apparatus earth connections well out of the way of the neutral earth, with its possibilities of extending its own potential near-by electrodes, whilst only the affected apparatus will be isolated by leakage faults.

A German System Commended

It is useless to talk of adequate protection of individual appliances by solid earthing, as the resistance of the small individual earthing electrodes will be far too high to enable fault currents to become sufficiently large to isolate the apparatus by means of the circuit fuses. I therefore suggest that this earthing protection should be effected by means of the small switches, switch-plugs, motor switches, &c., evolved for the purpose by the engineers of the Rheinisch-Westfalisches Power Company, of Essen, and now utilised on all rural installations under its immediate control. These devices require only a small driven electrode, with any resistance up to about 500 ohms, situated alongside the apparatus to be protected, in order to provide adequate protection for even the largest of apparatus. The high earthing resistance is permissible owing to the fact that the faulty appliance is isolated by a definite leakage current of about 25 to 30 milliamperes; so small a current cannot set up a potential gradient likely to be of the slightest menace to man or beast.

Two examples of bare-neutral wiring

For the lighter appliances there is a switch-plug, single- or three-phase, for currents up to 15 A; for the motor there are specially designed protective switches for currents up to 40 A per phase; for the isolated barn, utilising only lighting and with no power supply, there is a protective switch-fuse. In all cases, surrounding ironwork, or the metal framework of buildings, can be connected into the protective circuit, with the earthing electrode placed some small distance away, which will ensure that as soon as the protected appliance and the interconnected metalwork or metal building attain a potential above earth, due to leakage, of about 25 V, the faulty appliance will be isolated. Should the resistance of the earthing electrode be in the neighbourhood of 50 ohms,

Some Driving Forces in the Industry: Micanite and Insulators Co., Ltd.

1. Dr. G. E. Haefely, chief engineer. 2. Mr. M. Mohr, director. 3. Mr. A. Berkeley, chairman. 4. Major S. M. Mohr, managing director. 5. Mr. D. J. Greene, works manager. 6. Mr. W. D. Dankworth, micanite sales. 7. Mr. A. Collins, assistant chief engineer. 8. Mr. F. W. Woodward, purchasing agent. 9. Mr. S. C. Jager, London sales engineer. 10. Mr. S. W. Messent, designer and technical assistant. 11. Mr. H. A. Cooper, secretary. 12. Mr. R. F. Mayne, mica sales. 13. Mr. E. L. Potter, chief chemist. 14. Mr. T. A. St. Johnston, assistant works manager. 15. Mr. C. G. Wilde, paxolin sales. 16. Mr. R. L. Hetherington, works accountant. 17. Mr. L. Hall, sales engineer. (*Photographs Nos. 3, 5, 9, 10 and 14 by Elliott & Fry.*)

Bare-neutral Wiring (*Concluded from opposite page*)

isolation can be effected with a leakage potential of 10 to 15 V.

Further advantages of these switches are that the earth connection can be immediately tested by simply pressing a button, and in the case of the plugs this test is automatic; also that the isolation is independent of the circuit fuses, which are left intact and able to serve all other connected apparatus. The use of direct-on-line starters on farms leads to the installation of far heavier fuses than the motor requires, and this by itself prevents isolation of a faulty motor when solid earthing methods are employed. The devices cost more than a standard switch-plug or motor protective switch, but it is contended that the overall cost of an installation is reduced by their use, as a common earth circuit need not be provided throughout the installation, and earth connections may be easily and cheaply made, there being no need to strive after low resistance in individual electrodes. Two common types of earthing electrode in use abroad in conjunction with this protective system are either a small buried coil of galvanised iron wire or a small driven iron pipe.

Even should the installation cost a little more, in spite of these possible economies, the supply authority would be more than recompensed by the fact that only faulty apparatus is isolated, and not complete circuits. One can safely advocate a lower standard of installation work with this enhanced form of protection, and experience abroad indicates that, generally speaking, a cheaper class of farm installation has arisen with the introduction of artificial earthing. Non-metallic systems are being extensively advocated abroad, especially in America.

Tough-rubber and similar wiring systems have advantages for farm work, as general dampness and heat from animals make conduit work unsatisfactory. Bare v.i.r. wiring on cleats is not so mechanically sound as tough-rubber. An ideal system would appear to be stiff solid cables, or wires, instead of stranded ones, these being insulated in the ordinary way, and tough-rubber sheathed; solid wires are used in America up to No. 6, corresponding to our 7/.064.

The greatest advantage of all in the suggested arrangement, which involves the employment of a protective system untried in this country, is the elimination of the menace of the high-resistance earth connection. The high-resistance earth is not a correctable fault, or means would have been found ere now to correct it.

American Boiler Practice. By Vernon Walker, A.M.I.E.E.

Some recent improvements and innovations

THE report of the Prime Movers Committee of the N.E.L.A. shows that very few new boiler installations were put down in the United States in 1932, and there was apparently no outstanding departure from previous practice.

Official approval has been obtained for the A.S.M.E. code for fusion welding of boiler drums. Extensive experiments have been carried out, not only in America, but at home and on the Continent by leading boiler makers to determine the fatigue limit of welded drums. The bare electrode in general use could not be employed for high-grade pressure work since the absorption of oxygen and nitrogen makes the deposited weld metal brittle, and it became necessary to develop a new method of covering the electrodes and a complete new welding technique. Extensive investigation on full-sized drums has proved that the welded joint is free from any defects such as cracks, slag inclusion and lack of fusion with the basic material.

The use of X-rays for the examination of the weld has been found satisfactory. A 225,000-V tube is required for a 2½-in. plate, and a 300,000-V tube gives a range up to 4 in.; it is expected that the commercial limit for X-raying will shortly be extended to 5 in. Very satisfactory gamma ray pictures have been taken on a drum 6 in. thick; this method is slow, but a thickness up to 8 in. can be explored. Tests to destruction by hydraulic means have proved that the fracture generally takes place well away from the weld, and that, even if the weld fails, the fracture does not follow the weld but tends to turn into the solid plate, proving that the metal adjacent to the weld is not weakened.

Protective coatings, such as "Apexior," are extensively used for the internal surfaces not only of drums but of tubes and ducts. An excessive protective coating in the drum failed in one instance to provide protection against pitting; an excessive amount of mill scale due to the method of manufacture has been put down as the cause. Some coatings are inflammable, and care must be taken during their application to guard against an open flame. In some plants excellent results are obtained by painting the interior of the drum after first scraping and washing it, but in others good results are obtained without paint, the drum surface being merely scraped and washed.

A Welded-on Soot Blower

Cutting of boiler tubes due to the abrasive ash carried along by the soot blowers, improper spacing of soot blower nozzles, and moving of the hangers has been frequent. A new type of soot blower has been installed at Trenton Channel station in which the elements are welded to the back of the boiler tubes, saturated steam being supplied from a header at the back of the front baffle and passing to the element connections at the bottom of the front tubes. The elements are as long as the front boiler tubes and the nozzles cover the superheater elements; in order to support the elements tubes of circular shape welded to the soot blower elements are carried round the boiler tubes and welded at equal intervals. As it is not desirable to increase the size of the elements and operating head to permit the use of an increased number of nozzles due to the increasing width of the boilers, a blower unit has been designed capable of being moved from one position to another. The element "shuttles" in a stationary head through a rack and pinion mechanism. Where compressed air is being used for soot blowing, difficulty has occurred in maintaining the pressure, although the pipes are liberal in size and cleaning must be done more frequently than was at first thought necessary.

The flat gauge glass is much preferred to the round glass for pressures above 400 lb. per sq. in. The discoloration of the mica used behind these glasses causes considerable trouble due to loss of visibility. Breakage of flat glasses is often due to defective machining of the bodies. Slagging of the boiler and superheater tubes at high ratings seems to be general. There appears to be a definite relation between the slag formation and different ratios of exposed tube and grate surface, together with the effective distance from the grate to the tubes. Leaving out alternate tubes in the first, second and third rows of the lower bank of tubes has cured the trouble in several cases.

A Novel Screen

An outstanding feature in furnace design has been installed in one of the boilers of the State Line station, Chicago. This consists of a dust screen constructed of 2½in. tubes on 12-in. centres in each horizontal row, the rows being staggered. In the furnace each tube has a series of closely spaced studs welded to it and is covered with refractory to an outside diameter of 5 in. The screen shields the boiler tubes from direct radiation, and the slag and ash that pass through the screen are cooler and less sticky and do not clog the boiler tubes.

Continuous blow down systems are being used when the proportion of make-up is high, as when supplying steam for heating purposes as well as for generating electricity. In one case the connections from the drains of the boilers are jointed together and run to a flash tank which discharges steam at 3 lb. to the station exhaust range. The water is discharged from the flash tank through a level controller and passes through a heat exchanger before going to waste, the make-up being heated in the exchanger. The single-element feed-water regulator (governed by drum level alone) is liable to fluctuation with the rate of steaming, and a three-element control has been developed, operated from steam flow from the boiler, feed water to the boiler and water level in the boiler drum. As not over 20 per cent. of the total water volume of a modern boiler is within the drum at normal water levels, the level will be seriously affected by changes in the steaming rate. Globe valves are not suitable for steam connections to feed water regulators, water being trapped in the body of the valve; these are being replaced by gate valves.

Superheaters are giving considerable trouble, especially with hangers and supports; special metal is being used to prevent burning, and water-cooled supports are fitted in some cases. Sagging and warping of the tubes may be due to methods of operation and types of construction. In one case the practice of bringing the boiler up to pressure with the superheater flooded has been discontinued, as tests showed a more even and lower temperature with the superheater dry.

Superheat Control

A new method of superheat control is now being adopted on a double outlet boiler at Trenton Channel. On one side of the boiler a section of radiant element is installed, while on the opposite side there is a large section of convection elements as well as radiant elements. The radiant heat superheaters on both sides are in series with the convection elements. By unbalancing the gas flow so that more gas passes over the side having the convection surface, the superheat can be increased beyond the temperature existing with equal gas flow through each side of the boiler. By adjusting the gas flow between the two sides it will be possible to maintain a constant superheat over varying steaming rates. In several cases where radiant heat superheaters are used in combination with convection superheaters, the radiant elements have warped and burnt out due to unequal distribution and low velocity of the steam.

The chief source of maintenance in economisers is apparently due to leaking handhole gaskets, excessive flexibility, and generation of steam during starting periods being the chief cause of the trouble. The development and operation of diphenyl-oxide air heaters has been successful at the Bremo station of the Jersey Power Co., the diphenyl-oxide-naphthalene mixture showing no signs of deterioration. The heat transfer is almost equal to that expected and the operation and flexibility have also been approved. The commercial use of such materials as aluminium for heat insulation is being developed. Aluminium sheet foil, varying in thickness from 0.001 to 0.003 in. has given good results when separated by air spaces of 0.25 to 0.50 in. The heat loss due to radiation of aluminium, copper, or zinc when highly polished is less than 10 per cent. of that of an ideal black body.

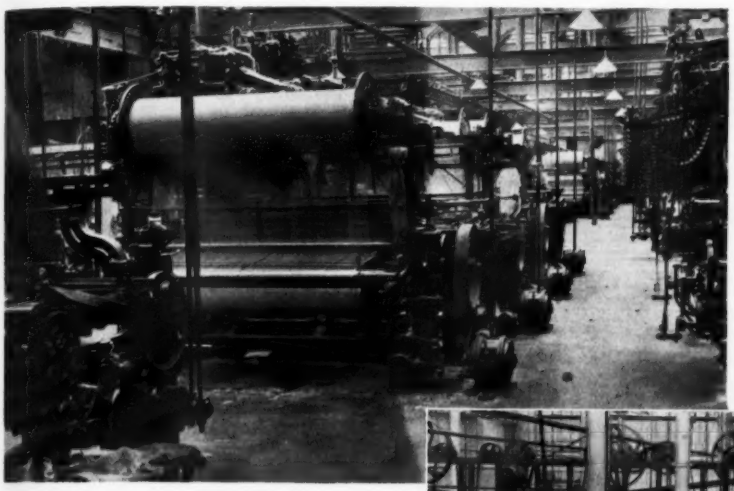
The Exact Control of Furnace Heat

An illustrated lecture recently delivered in London before the Association of Supervising Electrical Engineers by Mr. Verdon C. Cutts dealt with industrial electrical heating, the field of application of which was shown to be very large. The degree of precision possible in temperature control was one of the main features. An exactitude which had hitherto been regarded as commercially impracticable was now obtainable on a production basis under ordinary workshop conditions. For many purposes the electric furnace is capable of competing on a straight cost basis with fuel-fired furnaces. Even where the cost of electricity is greater than that of fuel for the same purpose, comparison of the overall working costs is not infrequently in favour of electric heating, one of the several reasons for this being the higher thermal efficiency obtained. The various types of furnaces were described by the lecturer and their uses for heat treatments and metal melting were outlined.

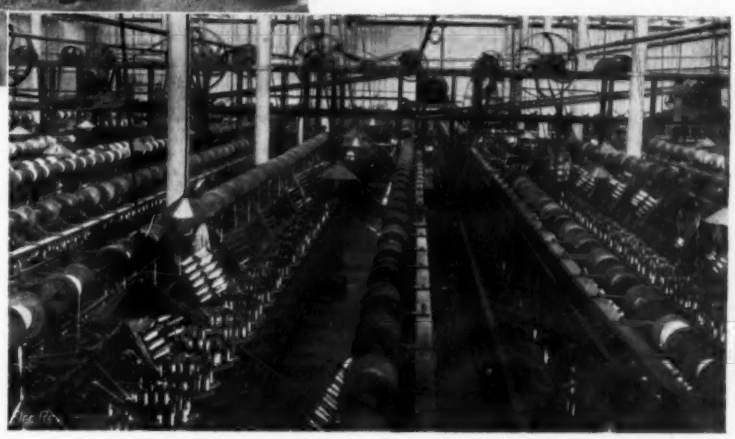
Group or Individual Drive? By A. G. Powell, A.M.I.E.E.

Factors which influence the decision

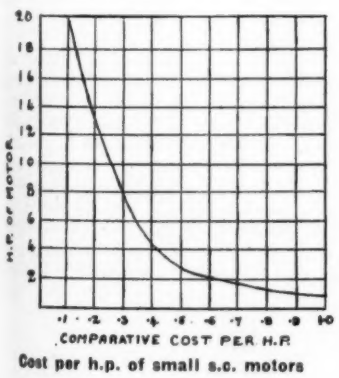
OF recent years the great reductions in the price of three-phase squirrel-cage motors and the general trend towards the individual drive of machines sometimes causes this method to be adopted without due regard to the whole of the factors involved and to its possible disadvantages. The question of group or individual drive is one which must be settled entirely by the particular circumstances of the case.



The principal advantage of the individual drive (and very often the only factor considered) is the elimination of shafting and belts and convenience of control. In some cases an efficient arrangement of machines from the operation standpoint puts the group drive out of the question, but for a straight-line layout, and where the machines are not too scattered, the group drive possesses very definite advantages. If low machine speeds are required, the group method provides the advantage of a double speed reduction between motor and machine, or, alternatively, may enable a high-speed motor to be employed, with consequent good effect on the power factor.



Examples of the two types of drive. Left: Individually driven looms in a textile works. Right: Group driving in an elastic web factory



Cost per h.p. of small s.c. motors

The horse-power of the motor required for a group drive will usually be considerably less than the aggregate of the separate motors required for the individual drive of the same machines, the difference depending upon the degree of intermittency of loading. The single motor will therefore operate at a considerably higher power factor and efficiency, due both to the better characteristics of a large motor, and also to the higher load factor. In the majority of cases the gain due to the higher efficiency of the single motor will at least equal the power loss incurred by the mechanical transmission system.

The size of motor required is usually overestimated, particularly in small powers, when the cost of the motor is totally disproportionate to its h.p. There is very little difference between the prices of ¼-h.p. and 1-h.p. squirrel-cage induction motors; but, assuming the maximum power required to be nearer the output of the smaller motor, the installation of the larger will result in a power factor and efficiency lower by 20 per cent. and 2 per cent. respectively. With the group drive the choice of motor size is not so important, as modern motors of medium size are usually designed to have a maximum power factor and efficiency at about three-quarter load, and the only penalty of overestimating the power required is the higher first cost.

The comparatively high cost of small motors is illustrated by the accompanying curve, which shows the relative cost per h.p. of three-phase six-pole protected-type squirrel-cage induction motors of up to 20 h.p. The costs of control gear and installation also become an increasingly larger proportion of the total as the size of motor is reduced. In general, the initial expenditure, including the cost of line shafting, belts, &c., is usually less than would be incurred by the purchase and installation of a number of small motors and control gear for individual drives. It is clear that this difference will increase with the number of machines in the group.

Any comparison of running and maintenance costs between the two systems will, of course, vary considerably with circumstances; the group drive will generally have the higher maintenance cost, although this may be balanced by the reduced running cost. It must be borne in mind that with individual drives there will also be some maintenance costs for the motor-to-machine drives.

Oil-engine Vibration

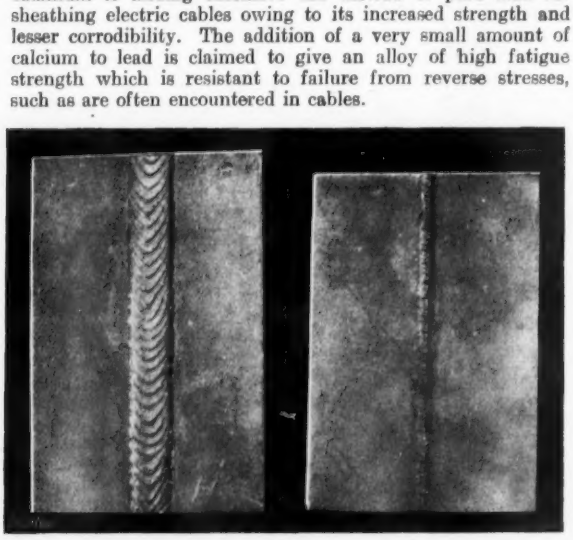
VARIOUS vibrational problems associated with reciprocating engines, particularly oil engines driving electric generators, are analysed in a paper by Mr. P. Jackson which was read before the Diesel Engine Users' Association in London on April 26th. Vibrations are all due to irregularties of balance, torque, or speed, and are magnified by resonance with natural frequencies. Remedies are described. The human being is very sensitive to vibration, particularly when lying in bed. At frequencies of 8 to 10 per second an amplitude of 0.01 mm. can be detected, but amplitudes up to 0.1 mm. are permissible in offices and houses without undue nuisance during the day. Greater amplitudes than these are inadmissible. The permissible amplitude varies with the frequency of the vibrations. High-speed engine irregularities which will not cause flickering of the light will not create excessive angular deviations from a mean position. The more frequent the engine impulses the worse the cyclic irregularity may be for parallel operation. Flickering of electric light is caused by variation in the temperature of the lamp filaments produced by voltage differences. The voltage varies directly with the speed of the generator. The angular deviation from a mean position is the difference between the position of the alternator poles caused by speed irregularity, and the position due to uniform rotation. Both these variations are caused by forms of speed vibration, and may be magnified if the frequency of the speed fluctuations coincides with the electrical hunting frequency of the generator and engine as an electro-mechanical system. This is known as resonance, and is only experienced with alternators in parallel, due to their capacity for pulling each other into step.

Lead Welding. By A. J. T. Eyles

Notes on materials and operation

THE fusion welding of lead is customarily known as lead "burning." This term is quite incorrect, as the operation produces a true fusion weld. The oxy-acetylene process provides a means of jointing lead faster than is possible by other methods, and the average jointer will quickly acquire the skill necessary to produce good autogenous joints. Success depends chiefly on thorough preparation, clean surfaces, suitable gases and equipment, proper material, and patience.

As the melting point of lead is comparatively low (327 deg. C.) and its capacity for conducting heat is relatively small, lead jointing with the oxy-acetylene flame should be quickly performed. Antimonial sheet lead is generally used for accumulator grids, and an alloy of lead with 0.1—2.10 per cent. cadmium is finding extensive use instead of pure lead for sheathing electric cables owing to its increased strength and lesser corrodibility. The addition of a very small amount of calcium to lead is claimed to give an alloy of high fatigue strength which is resistant to failure from reverse stresses, such as are often encountered in cables.



A flat butted joint and a vertical lapped seam

A 6 per cent. antimony alloy has approximately twice the tensile strength of chemical lead and five times the elastic limit; it is also 5 per cent. lighter than chemical sheet.

Preparing the Joint

Lead joints and component parts must be scrupulously clean. Cleaning fluxes are objectionable because by their evaporation they carry away some of the applied heat during the welding operation. The areas to be welded and the edges to be joined must be scraped bright, preferably with an ordinary steel shavehook.

For sheet lead weighing 5 lb. per sq. ft., which is called "5-lb. sheet lead" (0.085 in. thick), the seam should be about $\frac{3}{8}$ in. wide; that is, the edge of each sheet should be scraped bright to a width of $\frac{3}{16}$ in.; for 8-lb. lead (0.135 in.) the seam should be about $\frac{1}{4}$ in. wide. Thin sheets up to, say, a maximum of $\frac{1}{8}$ in. thick (2 to 4 lb. sheet approximately) may have their edges flanged to an angle of 90 degrees; the depth of the flange should be from one and a half times to twice the thickness of the sheet. The edges should be adjusted so that they touch exactly; for thicker lead or lead alloy sheets it is preferable simply to butt the edges. A good flat-butted joint on 8-lb. sheet lead and a good vertical or upright lapped seam on sheet lead $\frac{1}{4}$ in. thick are illustrated. When the metal is $\frac{1}{4}$ in. or more in thickness the edges are usually bevelled to an angle of 45 degrees, so as to form a right angle at the weld joint. This method enables the welding flame to come into direct contact with the whole of the surfaces to be joined.

Even the smallest excess of oxygen in the welding flame should be avoided, as this causes the lead to oxidise rapidly. A neutral flame gives the best speed and economy, although some operators prefer to use a flame containing a slight excess of acetylene. It is essential to avoid contact between the metal and the tip of the white cone of the flame in order to prevent excess melting. Care should be taken to fuse the metal to the bottom of the joint, but the molten metal should not be allowed to run underneath the seam.

The blowpipe should be held so that the flame is practically perpendicular to the surface of the work. The heating can then be localised and more easily controlled. If the blowpipe is slanted along the weld joint, the outer cone of the flame will probably melt the metal ahead of the point at which the operator is working. The technique is somewhat different from that required for iron and steel, but the difference is hardly any greater than between steel and aluminium, for example. In making vertical joints or seams in vats, tanks, &c., the welding should progress upwards.

The Welding Metal

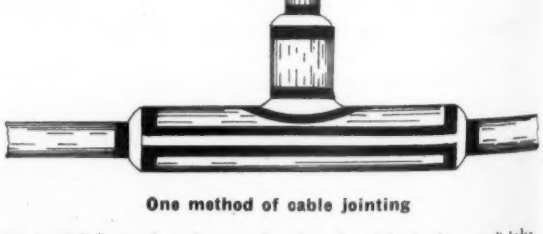
Rods, bars, or sticks for lead welding should not be kept in a damp or dirty atmosphere, or they will deteriorate, and when required for use the metal will not flow readily. Rods and bars cast a short time before being used are preferable for lead welding. In order to prevent the atmosphere attacking lead rods or bar in storage, it is a good plan to keep them in clean, dry sawdust. Welding rods and bars for repairing battery plates, bridges, terminals, &c., can economically be made by melting up old plates, terminals, and bridges, and casting them in moulds. A very simple method to employ when casting is to pour the molten metal into a bar of small angle-iron arranged V-shape, thus forming a rod or bar of any desired size.

Grouping battery plates

Ordinary lead strips, rods, or bars should not be used for the repair of any antimonial lead products or components owing to the higher melting point, which means that battery plates, &c., would melt and collapse before the lead from the strips or rods was thoroughly melted. Eight per cent. antimonial, for example, starts to melt at 245 deg. C. and becomes liquid at 296 deg. C. Thorough fusion is just as essential in the technique of lead welding as it is in welding steel.

Although high strength is obviously not a factor in lead welding, the applications are usually such that the welds must be perfectly sound and free from all imperfections which may cause losses through leakage, &c.

Illustrations are reproduced herewith showing the grouping of battery plates with oxy-acetylene equipment, and a method of making cable joints with plumber's solder and modern lead welding; the black bands in the latter picture indicate the position of the solder. In wiped joints with plumber's solder the two most prominent defects are (1) porosity due to the running of the tin in the solder caused by overheating, especially when the joints have been made with a blowlamp flame; and (2) when the blowlamp is used for a prolonged period on the joint, insulation is affected. One advantage of modern leading welding over wiping with solder is that only one metal is used and corrosion by electrolysis does not take place as when another metal, such as tin in solder, is in contact in a damp position.



One method of cable jointing

It may safely be said that a great saving in cost can be effected by the modern process of lead welding by oxy-acetylene, as compared with the old-fashioned soldering methods. This economy is due both to the cheapness of lead, in comparison with plumbers' solder, and to the greater speed with which the welding process can be carried out.

Electricity from Pumped Storage. By J. W. Meares, C.I.E., M.I.E.E.

A corollary to the Severn Barrage investigation

THE most important conclusion of the Severn Barrage Committee is that the intermittent power obtained directly from the tides in this estuary cannot compete in cost with that obtained from modern coal-fired stations at present-day load factors of about 33 per cent., but that, if combined with a reversible pumped-storage hydro-electric plant, competition would become possible, though with a rather narrow margin. The reason for this conclusion is that the maximum potentiality of the barrage occurs only at the fortnightly spring tides, *i.e.*, for a few days in each month. The enormous amount of extra energy available during these brief and intermittent tides could not well be fitted into the Central Electricity Board's system; even if it could all be absorbed, which is very doubtful, the considerable slack-tide interval would still have to be met (as at present) from selected or peak-load fuel plants.

The disadvantages of the diurnal cyclic variation of head during any one tide, though serious, are not comparable with the very great fortnightly variations of head as between spring and neap tides. Capital spent on the full utilisation of the additional head at spring tide must necessarily always be idle at mean and neap tides, and would be largely wasted if the vast number of extra kWh generated during a few hours had to be thrown directly into the grid while innumerable selected stations were running light (and increasing their costs) ready to take up the huge load as the tide fell.

But it might be worth while to spend this extra capital required for spring-tide generator sets, which will necessarily work at a low plant load factor, if the power from them can be stored hydraulically and then paid out exactly as and when required by the national system and without intermission—mainly, of course, at peak load times—from the secondary station. In fact this method may solve the problem of large-scale power storage, on the lines of the gasholder, in a way that is never likely to be met by batteries or thermal storage, not only from tidal power, but also from fuel power. So long ago (electrically speaking) as 1914 in my book "Electrical Engineering in India" para. 307 (now "Electrical Engineering Practice," fourth edition, para 182) I advocated pumped hydro-electric storage in connection with the Humphrey pump on precisely the lines now promulgated.

Application to Peak-load Stations

I suggest that it would be worth while for the Central Board or the Electricity Commissioners to see whether "peak-load" stations could be utilised continuously and to the full, exactly as is proposed intermittently with the Severn spring-tide plant. Such an investigation may even prove that it is unnecessary to spend fifty million pounds on a somewhat speculative project, of which the secondary part has not yet been examined in detail.

The net balance in favour of the combined scheme of tidal power and storage is not a large one: a matter of £1½ millions per annum on an expenditure of £50 millions, with many "unknowns" which might easily absorb this. It is authoritatively stated in the Report that power can now be generated from fuel at an overall average cost of about 0.375d. per kWh, which is expected to fall to 0.3d. soon. Power at a small load factor, generated to meet peak loads, costs "0.962d. and sometimes a good deal more," so that at the highest load factor it is obvious that the cost will be substantially less than 0.3d. Furthermore, when plant is in any case running round, the real cost of drawing *additional* units from it is but little more than that of the fuel alone, namely from 0.10 to 0.15d. per kWh. That, for instance, would be the actual cost of generation to a selected station with a 30 per cent. load factor selling an additional block of practically continuous power to a chemical works.

Now as the interconnected system of the grid enables power to be put in or taken out anywhere, it logically follows that this same block of power, at present unwanted and unused, could be utilised exactly as the spring-tide power of the Severn is to be used. All that is necessary is to develop suitable elevated reservoir sites, not necessarily anywhere near the peak-load fuel stations: Wales abounds in such sites. The amount of elevation or head does not greatly affect efficiency of conversion, but it is important because the capacity of the reservoir must vary inversely as the head for a given amount of energy stored, so that low heads involve far more expense in dams.

The lure of the Casino at Monte Carlo is enhanced by the brilliant floodlighting of the building and gardens, a view of which is reproduced above

In the scheme here outlined only a fraction of the proposed Severn-Wye auxiliary storage will be required in relation to the annual output of energy, as the cycle of operations, instead of being fortnightly, will be daily or perhaps twice daily, according to the peaks and hollows of the national load curve. Nevertheless, there must also be a storage basin at the site of the power house and pumping plant, to hold the whole of the tail water ready for use over and over again. If the reservoir site has natural flow into it, so much the better, but this will not make much difference to the pumping hours and (in view of droughts) it will not reduce the amount of storage at all. In any case, it is probable that this natural flow will eventually be commandeered for a national water supply grid or a town supply, and the upper reservoir should be designed with this not distant prospect in view to the extent of arranging for an additional pipe for water supply only in the draw-off tower.

The lower storage need not have depth so long as it has the required capacity, and an earthen dam (as used in some of the schemes of this nature now maturing on the Continent) would meet all requirements. It might prove practicable to make such a secondary station semi-automatic operated ordinarily by supervisory control, but with a sufficient staff to attend to routine matters and emergencies.

Possible Savings

The calculations of the Severn Barrage Committee show that with an overall efficiency of the double conversion of 60 per cent., three-fifths of the power used in high-level pumping can be recovered as hydro-electric energy, so that the extra energy generated by fuel at 0.15d. per kWh (taking the higher figure) will after conversion cost 0.15d. × 5/3 or, say, 0.25d. exclusive of the capital charges of the secondary station. The latter charges for the Severn scheme appear to be about 0.2d.

per kWh, though this can only be inferred from the Report—no doubt the actual figure is known to the Committee—and on a similar load factor the same cost might fairly be taken. The figure, however, depends *entirely* on the plant load factor of the secondary station.

In the case under consideration the plant load factor would be low, as the stored power would probably be used for peak loads only. Assuming it to be such that the capital charges on the secondary station would be double the above, or 0.4d. per kWh, bringing the total costs up to 0.65d., there would still be a large margin before the minimum cost of peak-load generation was reached, namely "0.962d. and sometimes a good deal more" quoted as the best figure obtainable from modern stations operating on a 10 per cent. load factor.

The overall cost of constructing hydro-electric reversible plants in unknown localities cannot even be guessed; it depends mainly on the site chosen and on the cost of the dam and pipe-line at that site, though the cost of the plant itself will vary a good deal with the head. But the speculative margin of 0.31d. per kWh shown above—about 33 per cent. on 0.962d., and perhaps 40 per cent. on the "good deal more"—is so great, especially as compared with the narrow margin of the Severn scheme, that it is certainly worth looking into. The Niederwartha plant near Dresden, which employs the off-peak power of the State fuel plants at Hirchfelde and Bohlen, points the way.

Time-switch Manufacture

FROM its early experience in producing precision gauges it seems a natural development of the Horstmann Gear Co., Ltd., to manufacture time switches. We visited the company's works at Bath recently, and the following are a few of our impressions.

With the exception of the escapement, both the movements and the switches are manufactured entirely in the factory. Modern stamping, drilling, turning, &c., methods are employed in the production of the various parts, and the machine-shop equipment includes some very fine examples of high-speed automatics. Teeth on the wheels and gears are generated by the hobbing process, and the hobs are checked by a visual projection examination which, in addition to showing whether the measurements of the hob are correct, also discloses any irregularities which might exist on the cutting tooth of the hob and have a bad effect on the gear.

All the pinions are specially heat treated, so as to render them amply hard for their job, but at the same time leave the cores soft and not distort the pinion in any way. The visitor's first impression is that the bulk of the work constitutes hand assembly, and certainly this takes up the greatest floor space, but watching some of the machine tools at work later one gets an idea of high-speed mass production.

Interchangeability of Movements

With only a few exceptions the movements are all readily interchangeable on standard switches by a simple screw and key locking arrangement, and such attachments as Sunday cut-outs and Thursday advance gears can be accommodated without interfering with the interchangeability.

(1) A movement and switch, depicting the interchangeability; (2) choke and switch components of dimming outfit; (3) the new solar attachment

The company has now adopted a 50 per cent. safety factor above the British Standard requirements.

A recent introduction is a solar attachment which enables almost any lighting schedule to be followed with unusually great accuracy. Two cams control the movement of a rack which, in turn, controls the movement of the main operating tappets.

On the copper dippers of the mercury cup switches is electro-deposited a coating of special metal which eliminates amalgamation between the mercury and copper, and consequent "growing," without decreasing the surface conductivity of the dippers. The surface is relatively untarnishable. On test a dipper has been heated so much that the copper has melted and run out, leaving the skin practically intact. For the insulation the company is using a special material of the synthetic-resin family which has anti-tracking properties, is almost non-hygroscopic, and highly resistant to acid and heat.

Inspection Methods

In addition to normal workshop inspection the equipment is dealt with in a separate inspection department. A rather novel testing method determines not only any bad contacting between the actual moving contacts themselves, but also instantly shows up the slightest trace of a faulty connection such as between the brush and its operating member.

A section of the electrical assembly department

Apparatus recently devised for electrically timing clocks will result in even greater accuracy. It also determines escapement irregularities. Sound from the ticking is converted into movement which is amplified and recorded in such a way as to show irregularities by comparison with similar movement from a standard.

As a side line—in that it is not a time switch—the company is now ready to produce commercially a dimming outfit which consists essentially of a tapped choking coil, measuring in its metal case only about 3 in. by 2 in. by 1¼ in. projection, and a multi-way switch. There is a definite saving in consumption by the voltage reduction, but it is not, of course, *pro rata*. Perhaps of greater importance, however, is that, as the switch has to be passed through the choke stages to full on, surge current is eliminated. On test with three tap positions, using a 100-W, 220-V clamp the following figures were obtained: Full on, 105.6 W; highest tap, 88 W; medium tap, 79.2 W; and lowest tap, 66.5 W. The two smaller taps are alternatives.

An Electrically Welded Barge

The *Peter G. Campbell*, an all-electrically welded barge, was recently launched from the Wallsend yard of Messrs. Swan, Hunter and Wigham Richardson, Ltd. The vessel has a capacity of 1,700 deadweight tons, there is a total absence of riveting, and the entire hull with its frames, beams, decks and bulkheads is welded throughout. The result is a lighter and more rigid structure than is obtainable with the ordinary method of riveting, while the costs of building were no greater. The barge has been built for Dominion Tankers, Ltd., of Toronto, and will be used for the carriage of oil in bulk on the Great Canadian Lakes and canals. Her length is 179 ft. and breadth 34 ft. There are no overlapping seams, for all plates, decks, and bulkheads have been butted against each other and welded, leaving flush surfaces.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Single Side-band Radio Telephony

THE application of the single side-band system of transmission to short-wave radio-telephone links is discussed in the long paper by Mr. A. H. Reeves, which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 3rd. Only a few of the existing fifty radio-telephone links are at present working at anything like full-load capacity. For this reason the chief problem is one of reducing operating costs. On a few heavily-loaded links, however, the expense of some improvement in circuit performance would be justified.

On an existing typical link, either with light or heavy traffic, the single side-band suppressed-carrier system would be expected to save about 87 per cent. of the valve replacement costs, and 90 per cent. of the cost of the power. It should be equivalent in signal-noise ratio to increasing the peak power of the transmitter about sixteen times. If this factor is allowed for, by greatly reducing the transmitter size, single side-band working should still give circuit improvements in relation to fading quality and privacy. The system eliminates the chief cause of distortion at present, *i.e.*, that due to selective fading-out of the carrier. It should also make workable several well-known privacy schemes at present useless during selective fading, and give rise to a promising new method. A possibly new means of reducing distortion due to intermodulation in Class 3 single side-band amplifiers is referred to.

Experiments carried out by the author on three short-wave links, using equipment on the lines suggested, between Madrid and Paris showed that the expected improvements over double side-band working were fully obtained. A maximum synchronising error of 6 cycles per sec. over periods of several hours was found to be possible by the means employed.

It is suggested that a simplified form of the receiver described could be used commercially, and would meet requirements for at least the next few years. In this connection a somewhat new form of filter, on the "balanced reaction" principle, is described. For the immediate future the principle used in the transmitter should be that of "side-band balance," *i.e.*, a method of selecting the side-band in one stage directly at the final high frequency, without relying on filters.

Assuming selective fading to be absent, synchronising at the exact frequency, within predetermined phase limits, is fairly simple. One form of circuit to do this is described. A high-quality circuit is explained, giving exact synchronism in phase except during periods of deep fading, when the frequency difference may amount to a few cycles per second.

A night view of the new Dunston station, reproduced from a photograph by Mr. W. F. T. Pinkney

The Travel of Wireless Waves

IN the annual Kelvin Lecture, which was delivered before the INSTITUTION OF ELECTRICAL ENGINEERS in London on April 27th, Sir Frank Smith, secretary of the Department of Scientific and Industrial Research, told the "story of the radio telegraphist surprising himself and others by doing things which he was hardly expected to achieve, the physicist offering qualitative explanation of the achievements, and the mathematician bringing up the rear in a constant effort to make his too simple theory sufficiently complicated to agree with the experimental facts."

The biggest shock for the theoretical worker was provided by the results obtained by amateurs operating with very short waves over long distances with power equivalent to that absorbed by an ordinary incandescent lamp. From the theoretical formulæ based on the inadequate conceptions of that time, signals as strong as those actually observed could not have been received if the whole power of the Niagara Falls were radiated from an antenna.

Sir Frank showed the importance of the upper atmosphere and indicated how it could become ionised so as to form electrically conducting layers which deviated the energy radiated upwards by transmitters down to earth again with little loss at distant receiving stations. The constitutions of the lower and upper atmospheres were discussed and the significance of thunderstorms, the aurora borealis, terrestial magnetism, and magnetic storms was touched upon. The lecturer said that the existence of the conducting layers generally explained qualitatively the phenomena met with in the travel of wireless waves.

The Cure for Fading

The only cure for fading, he said, lay in the concentration of increasing proportions of the radiated energy into the ground ray, so that on the one hand the distance at which it was attenuated to equality with a fixed downcoming ray was increased, while on the other the absolute intensity of the downcoming ray was simultaneously decreased. Special antenna arrangements were available for such purposes as these and they were proving themselves to be of substantial value.

The radial application of such devices would much reduce the scope of foreign listening on the medium waveband, which was practically wholly effected by ionospheric rays, but many listeners would, Sir Frank thought, agree that this was not too high a price to pay for the reduction of fading troubles on home stations. Foreign listening would not be made entirely unattainable even by the most complete application of this method, because the rays leaving a sufficiently distant station in a horizontal direction, *i.e.*, tangentially to the spherical earth, would reach the ionosphere at a flat angle and would be well reflected to become again tangent rays some 2,000 km. or more from the sending station.

Although other scientists had told the radio-telegraphist that his necessary conducting layers in the atmosphere were likely to be present, they had really few definite data concerning them to give him. For the radio-telegraphist to understand fully how his waves travelled and arrived, it was necessary for him to obtain numerical information of the heights of the layers and of the number of electrons likely to be present in them at various seasons and various times of day. In this country such knowledge was being rapidly accumulated under the auspices of the Radio Research Board, and in this work Professor E. V. Appleton was closely co-operating. He and his co-workers had developed methods for determining the heights of the layers and for recording the heights throughout the day.

There were two layers, the lower "Kennelly-Heaviside" layer at 90 to 120 km. and an upper "Appleton" layer at 230 to 350 km. up. Recently Chapman had given reasons for believing that the ionising agent for the lower region consisted of neutral atoms shot out by the sun and travelling with a velocity much less than that of light. Such projected particles would be unaffected by the earth's magnetic field and would ionise the gas molecules by collision.

The radio-telegraphist turned geophysicist quickly took ad-

vantage of one of nature's phenomena to test these theories. During the total solar eclipse of August 31st, 1932, observers made measurements of the critical wavelengths which could penetrate the layers. The results appeared to establish beyond doubt that the principal ionising agent for the lower, Kennelly-Heaviside, layer was ultra-violet light. The possible bombardment of the earth by numerous neutral particles was not yet wholly excluded, but undoubtedly the evidence so far was against it. The evidence of a common ionising agent for both regions of the ionosphere was supported by evidence involving one of the unexplained anomalies in the travel of wireless waves. Part of this evidence was also useful in illustration of the probable absence of any higher electron content than that of the Appleton region at any height in the ionosphere.

The telephone service between Rome and Sardinia, on a wavelength of ten metres, could be overheard at Slough throughout the summer of 1931. But on November 1st it became inaudible, and was not heard again until May 2nd, 1932. This might be interpreted as showing that the maximum electron content in the Appleton region fell, on the winter dates given, below that necessary to return the incident energy, even at grazing incidence; that the signal escaped by "electron limitation"; and that on May 2nd that "ionospheric winter" ended as the increasing electron content due to solar action passed the arbitrary limit thus set. The remarkable feature of this observation was, however, that the dates thus set for winter at the top of the Appleton region were identical with those found by Hollingworth for the base of the Kennelly-Heaviside region some years previously. In fact, those dates were used in the first weather forecast for the ionosphere, a forecast which was quite undeservedly more successful than some tropospheric forecasts. The evidence of close similarity in the mechanism of ionisation at heights below 100 and above 200 km. was very significant, especially when read along with the eclipse evidence already quoted. The lecture was illustrated with cinematograph films and echo reception and cathode-ray oscillograph demonstrations in co-operation with Mr. R. A. Watson Watt and his co-workers.

Where Experts Differ

A LONG and profusely illustrated paper on the investigation of mechanical breakdown of prime-movers and boiler plant by Mr. L. W. Schuster (published by permission of the British Engine, Boiler, and Electrical Insurance Co.) was read before the INSTITUTION OF MECHANICAL ENGINEERS in London on April 28th.

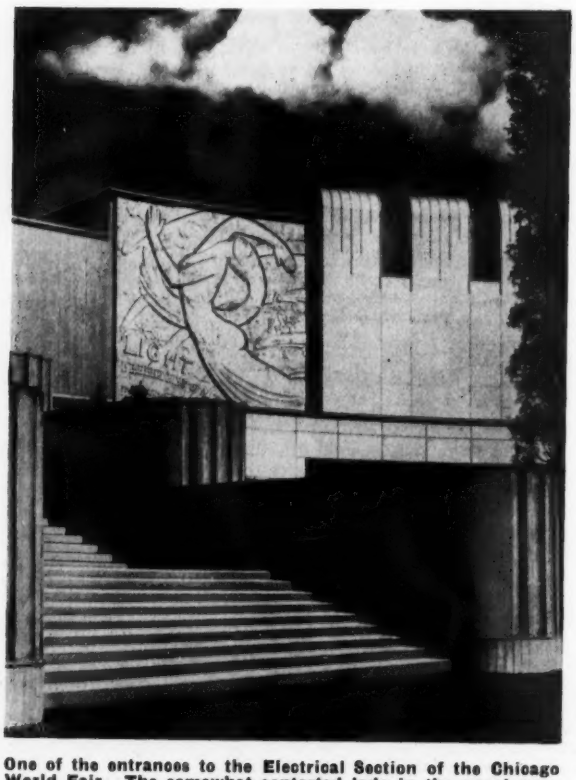
Though the author is of the opinion that by far the majority of breakdowns in service are caused primarily by excessive stress or defective design, a small proportion has been hastened by the use of inferior material, or material that has been faultily heat-treated. Though prominence may appear to be given to examples which show that the material has been to blame, these have been described on account of their special interest, not because they are the most common form of failure nor because the metallurgical aspect of failure has been given undue prominence in investigations.

The use of metallurgy in an investigation into failure in service has proved itself to be of inestimable value, but in an inquiry it cannot of necessity have the value that it has in an investigation of a trouble during manufacture, where it is more often of paramount importance. If a practical engineer who has not studied metallurgy, and a metallurgist who has no practical engineering experience, are given a broken part and asked for the cause of failure, in nearly every instance the reply of the practical engineer will be of far more value to the user than that of the other. If a pure metallurgist is given a broken part and asked the cause of a breakage, he will always be able to point out some weakness; all metal contains some defect or other. Again, a metallurgist often finds what apparently is a serious defect, while investigation from the mechanical aspect shows clearly that that defect has had nothing to do with the failure. The argument used applies even more to an investigation undertaken by a chemist; neither the engineer nor the metallurgist should be subservient to the chemist, whose function should be to assist them. In this way many fallacious verdicts could be averted.

American Blast-furnace Practice

ONE of the several papers presented at the annual May meeting of the IRON AND STEEL INSTITUTE in London this week is by Mr. W. A. Haven, of Cleveland, Ohio, and deals with recent developments in American blast-furnace design and practice.

Dry cleaning the furnace gas by electrical precipitation has found application in only a few cases—generally where water for wet scrubbing was not available. It has proved very useful, however, at plants producing ferro-silicon which charge a certain amount of coal and consequently have tar in the gas to contend with. Final cleaning alone represents 0.132 cents, of which 0.09 cents is the cost of power. The power cost for final cleaning is approximately 12 cents per ton of pig iron or $120.00 per day for a 1,000-ton furnace. This will explain the unusual efforts that have recently been made to develop a less expensive means for final cleaning, particularly one in which the power consumption can be substantially reduced. The greatest success in this direction has followed the adaptation of electrical precipitation to cold wet gas. A continuous flow of water over the discharge electrode makes cleaning continuous and independent of manual or mechanical operation. The precipitated dust is sluiced away in the form of sludge. The equipment is otherwise very similar to the Cottrell units used for dry precipitation: it is much like a vertical tubular boiler with a twisted bar suspended through each tube; the bars are the discharge electrodes and the insides of the tubes the collecting ones.



One of the entrances to the Electrical Section of the Chicago World Fair. The somewhat contorted lady in the panel symbolises "Energy"

A Cylindrical Precipitator

In another type of precipitator developed during the past year advantage is taken of an impingement effect and of abruptly changing the direction of gas flow. Also, in contrast to the common procedure of carrying the gas flow substantially parallel to the corona discharge, in this machine the gas is forced through the discharge, thus ensuring the ionisation of all portions of the gas stream. Structurally the new unit may be described as two open-ended cylinders, one suspended concentrically within the other; the gap of about 4 in. between the two is the ionising field, the inner cylinder being the discharging electrode and the outer cylinder the collecting one. The corona discharge is facilitated by a series of vertical fins. Both cylinders are of aluminium, and the collecting one is smooth surfaced to facilitate the flow of the wash water and the deposited dust. Gas is led into the gap from the inner cylinder through vertical slots, and out through similar slots in the collecting electrode; the opposing slots are staggered, thus bringing about an abrupt directional change in the flow of the gas, which causes it to pass through the corona discharge, as previously noted. By the use of valves for current rectification adjustment and regulation are simplified.

The outstanding feature of the wet-electric cleaners is their low power consumption. As compared with mechanical scrubbing, the energy requirements are approximately as one to ten. For the final purification of primary washed gas of about 0.15 grains per cu. ft. dust content only 1.0 kWh per 100,000 cu. ft. is needed. Assuming a power cost of 0.8 cents per kWh the saving is about 8.1 cents per 100,000 cu. ft. of gas, or 11 cents per ton of pig iron. The electric cleaner requires no mechanical driers or after-heaters, being in itself a highly efficient means of removing entrained moisture.

Blast-furnace plant blowers and electricity generators in earlier installations generally utilised steam generated from blast-furnace gas; in some cases gas blowing engines and gas-engine-driven generators were used. In new or modernised plants, steam-turbine-driven units have predominated, mainly for the reason that these require the least expenditure of capital, permit the greatest flexibility in operation, and because a boiler house, being needed for general plant purposes, makes a supply of steam readily available.

For handling materials electrically driven transfer cars, hoists, and belt conveyors are used. With a single switch a lorry car operator may put into operation machinery that will fill a skip of ore and two or three of coke without further attention. This kind of installation is known as a "one-man stock house." The cars have electrically or air-operated brakes, and full electrification enables all the furnace filling mechanism to be interlocked.

* * *

Modern Power Stations

A paper on modern power station design was read to members of the BIRMINGHAM ELECTRIC CLUB on April 28th, by Mr. T. E. Boothby, chief power station engineer to the Shropshire, Worcestershire and Staffordshire Electric Power Company and the South Wales Power Company. The water tube boiler of half a million pounds evaporative capacity, and the 100,000-kW turbo-alternator (London Power Co.), showed that development had been rapid and striking in the past ten years, during which period numerous examples of modern extensions had been carried out by many undertakers, who had at the same time used the data obtained from such extensions as the basis for design in entirely new stations. Special features were the neatly arranged auxiliary plant, which allowed for shorter and straighter runs of pipe-work, cleaner and cheaper methods of fuel and ash handling, and the greater use of feed water heating, air heating, and inter-stage steam reheating as originally developed by Dr. Ferranti. Improvements to switchgear provided maximum protection and gave clean accessible cable runs. In almost every case closed-feed systems had been installed, together with evaporators for water softeners and de-aerators. There would soon be an opportunity of examining the results obtained by two widely differing methods of dust prevention; one at Hams Hall, which provided for taller chimneys, and an electrolytic dust collector of the Lodge type; the other at Battersea, which was the flue gas washer, developed at Grove Road by Dr. Pearce, of the London Power Company.

Measuring Absolute Resistance

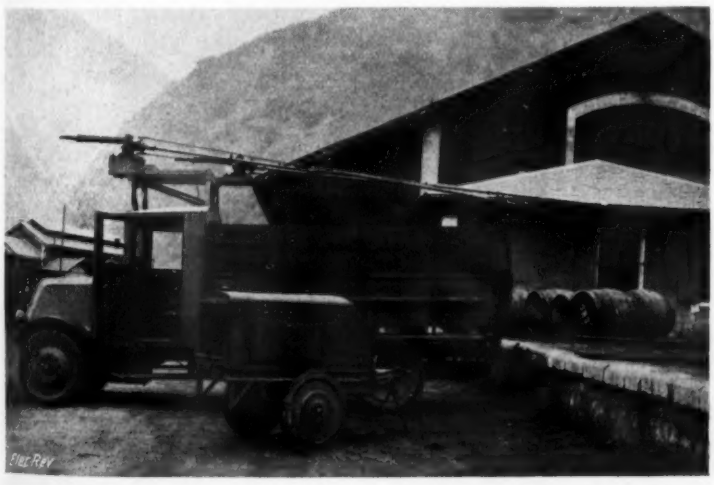
Among the several papers read at the PHYSICAL SOCIETY in London on May 5th was one by Dr. H. R. Nettleton and Mr. E. G. Balls, both of Birkbeck College, which describes two simple methods of absolute measurement of electrical resistance. One method uses a sinusoidal a.c. of 15 mA derived from a valve oscillator and of a frequency equal to that of a König tuning-fork, which is allowed to induce an equal current in a secondary circuit. The equality of amplitude of the primary and secondary currents is judged by the aid of a Westinghouse instrument rectifier. The resistance of the secondary circuit is derived from a formula and resistances have been measured ranging from 16 to 67 megohms. In the second method equal primary and secondary currents of known frequency are also produced and are further adjusted to be in quadrature. A simple arrangement is thereby derived which enables Campbell's two-phase a.c. method of measuring resistance to be carried out in the laboratory. In both methods a visibly beating circuit is employed which enables the frequency of the current used to be tuned easily, with precision, to that of a valve-maintained fork. This beating circuit is also of value in checking the relative accuracy of forks whose frequencies are very approximately in simple ratio to one another.

How Electricity is Changing Industry

The commercial uses of electricity formed the subject of an address by Mr. G. S. Francis, of the British Electrical Development Association, which was delivered last week at Cardiff at the COMMERCE STUDENTS' UNION. The present industrial state was described as one of transition and transformation. Fundamental changes were taking place and their nature was largely that of electrification. Electricity, in fact, promised to become the principal motive force in industry. Its use on a commercial scale changed scientific and industrial methods, and therefore main developments were on an electrical basis, enabling new types of machinery and apparatus to be devised. The electric drive had revolutionised conditions in many departments of industry.

Electric Trolley Lorries

ELECTRIC trolley buses are now common, but the application of the principle to goods truck is seldom seen. A French undertaking has recently adopted the system. The electric tramway between Moutiers et Brides-les-Bains, which dates from 1894, having reached a stage when track and vehicle renewals had become necessary, it was decided about two years ago to adopt trolley buses and to extend the line to Le Villard-du-Planay, a total distance of about ten miles. The route is a very hilly and winding one, there being a difference in altitude between the terminal points of approximately 1,100 ft.

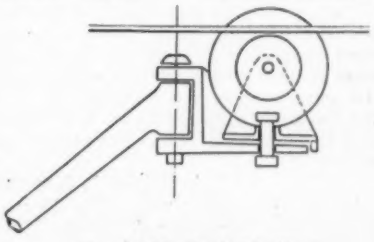


One of the "Vetra" four-ton lorries and its trailing power plant

For passenger-carrying purposes the company owns a fleet of eight "Vetra" buses, each having seating accommodation for twenty-four persons and standing room for ten more. The chassis are of Renault manufacture with Alsthom electrical equipment operated with 650-V d.c. power, converted from 15,000 V a.c. at a station at Brides about 3¾ miles from the lower terminal station. The overhead line is of the twin cable type, and between Moutiers and Brides, the busy part of the line, it is in duplicate to allow vehicles running in opposite directions to pass one another without delay. Between Brides and the upper terminal point at Le Villard there is only a single overhead line. A feature of the installation is the special doubly pivoted trolley illustrated which has been devised to enable the motor trucks to negotiate the sharp bends on the road without material reduction of travelling speed.

The noteworthy feature of the new line is the running intermediate with the passenger buses of four electric goods trucks capable of maintaining an average speed of about 14 m.p.h. The tramway undertaking has held a contract for some years for the transport of the raw material and manufactures of the Compagnie Bozil-Maletra, whose works are situated at the upper end of the line. For a long time petrol trucks were used for the work, but as the time had arrived when new vehicles were necessary it was decided to adopt trolley trucks. These are also of the Renault type; they have a carrying capacity of four tons and run on pneumatic tyres. Outwardly the vehicles closely resemble ordinary petrol lorries, the electric motor being fitted under the customary engine bonnet at the front.

A novelty is the use of a small electric power generating plant mounted on a two-wheel trailer. This was adopted to allow the trucks to be driven to any desired part of the works which they serve where no overhead line is available. The generating set consists of an 8-h.p. petrol engine and 80-V dynamo capable of furnishing sufficient power to drive a fully loaded truck over muddy ground at a speed of about 1¼ m.p.h. Both the buses and the trucks have been in operation for about a year, and are reported to have given every satisfaction even during the winter months. We are indebted to our French contemporary *Le Véhicule Electrique* for the illustrations.



The double-pivoted trolley

The E.A.W. Conference

Stressing the importance of rural development

THE eighth annual conference of the Electrical Association for Women opened in Birmingham on Wednesday with a reception by the president (Dame Ethel Shakespear) and the committee of the Birmingham and Midlands Branch at the Grand Hotel.

At the opening session yesterday, which was held at the West End Hall, Lady Moir (president, E.A.W.) took the chair, and among those supporting her were Dame Ethel Shakespear, the Lord Mayor of Birmingham (Coun. H. E. Goodby), and Professor Wm. Cramp (Professor of Electrical Engineering, Birmingham University). Papers on "Electricity and the Countrywoman" were read by Mr. J. T. H. Legge (managing director S.W. and S. Electric Power Co.) and Miss Henriette W. Nissen (Department of Agriculture, Norway). The first paper was preceded by a short cinema display. After the annual luncheon at the Grand Hotel, a visit was paid to Hams Hall power station, where Mr. Frank Forrest (chief engineer, Birmingham Corporation) had agreed to give a short talk on "Modern Methods of Producing Electricity."

The evening was set aside for a reception at the Grand Hotel by the chairman (Ald. Sir Percival Bower) and members of the City of Birmingham Electric Supply Committee.

Rural Electrification in Great Britain

Mr. Legge, in his paper, referred to the influence of Women's Institutes in rural areas. The first was formed in Wales in 1915, and they now numbered 5,000. In the area of the S.W. and S. Power Co. within the past ten years some 250 villages had been supplied, and further villages were now being connected at the rate of one per week. Electricity had made it unnecessary for the countrywoman to get up so early and had given her time to take up handicraft, fruit bottling, &c. During the past five years clean factories employing thousands of men had sprung up in country towns after the advent of the electric power line.

[*Lafayette*

Mr. J. T. H. Legge

In Evesham and the surrounding villages one in every four of the homes served used electric cookers and nearly every home had its electric iron. Many hundreds of those homes, using electricity for lighting, cooking, ironing, boiling water, and all-mains wireless sets, were occupied by farm labourers receiving small wages. In most cases the change had been from oil direct to full electric service for lighting, cooking and heating.

The greatest difficulty was the first cost of electrical apparatus, but great reductions had been made during the past two years, appliances which had cost £12 now being obtainable for half that sum. Houses were wired for an initial payment of 2s. or 3s. per light, the balance being defrayed by slot meter or quarterly payments. The supply authority did not leave the housewife alone after her house had been connected to the mains. It was always there ready to help. The inability to secure wayleaves on reasonable terms sometimes proved a stumbling block to giving supplies to villages, the owners or occupiers demanding special consideration out of proportion to the use made of the service; the help of the countrywoman here would bring about cheaper electricity, and so also would her missionary work in securing new connections.

The Board of Education had realised the necessity of affording every child an opportunity of learning the value of electric service in the home. Many domestic science classrooms were equipped with electricity throughout the country. We must see that when electricity reached each village and hamlet the countrywoman was ready for it. It was the ambition of the electricity supply industry to give service at such a price that every member of the community could not afford to be without it.

Activities in Norway

At the outset of her paper, Miss Nissen gave some statistics relating to water-power development in Norway. The h.p. available was estimated at 15 million, of which it would pay to harness from 12 to 13 million; so far only 3 million h.p. had been developed.

The rural population of Norway was scattered in farms, never in villages. Distribution was therefore very expensive, but 70 per cent. of all homes were connected. The undertakings, which were mostly publicly owned, ran their lines up to the house walls, the occupier being responsible for the installation of the circuits in the house; he usually bought his own appliances. These he took with him if he moved, but the various voltages in use (generally from 200 to 230) introduced difficulties.

Electricity for domestic purposes was sold either at a kWh rate or for a fixed sum (usually about £10) per kW with a current limiter. Load factors of 50 to 60 per cent. were quite common, and the average rate was therefore low. These current limiters did not permit any increase in the demand when most required, and some of the supply undertakings wished these consumers to revert to the kWh rates, but the housewives were opposed to a change, as the limiter provided a check on their expenses.

Miss Nissen expressed the view that a mixture of the two rates would be the solution, *e.g.*, 400 to 500 W for lighting, ironing, and hot water on the limiter rate, and the rest of cooking and heating at a kWh rate. The limiter tariff had produced the storage cooker, one element of which was placed under an iron block which stored heat during the night. These cookers used a good deal of energy and were expensive; they kept the kitchen warm in winter, but too warm in summer.

The four salient points in electrical development were: (1) availability to all; (2) a low competitive price; (3) all apparatus must be of robust and practical design, as well as safe; (4) housewives needed instruction in the use of apparatus and in electrical details.

Eight or nine years ago the Association of Norwegian Electrical Power Plants had set up a committee to test all electrical household appliances brought on to the market. The committee gave its opinion as to the quality and suitability of apparatus. This opinion became the public standard. Manufacturers took an interest in the work of the committee and endeavoured to keep in line with the standard set. Attention was paid to such details as the time required for ovens to reach the proper temperatures, the distribution of heat in ovens, and facilities for keeping them clean.

A section of the new international telephone exchange, London, E.C.

On the committee were two women appointed by the Ministry of Agriculture. All the practical tests were performed in the Training School for Teachers in Domestic Science, which came under the Ministry of Agriculture, by one of the teachers (who was a member of the committee) as her main duty. Miss Nissen said that she had been in charge of this work for six or seven years. Reports of the tests on different apparatus were issued as pamphlets.

Instruction in the use of electricity in the most economical way was important; *e.g.*, the current should be switched off from the closed plates before cooking was quite finished, and utensils with level heavy bottoms should be used. All pupils in domestic science were required to be taught some electrical theory as well as the practical application of electricity and the carrying out of minor repairs, and what to avoid in the interests of safety.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Electricity Charges at Congleton

I wish to draw your attention to a mis-statement which appeared in last week's issue under the heading of "Minimum Charges." This reads as follows:—

"The Town Council has adopted a minimum charge of 5s. per quarter for power consumption for domestic appliances, including wireless sets and reading lamps. The charge will be in addition to meter rent."

For your guidance I wish to mention that my Council has adopted a recommendation from my committee to make a minimum charge of 5s. per quarter for power consumption for domestic appliances, and has agreed that wireless sets will come under this heading. This step has been taken as a result of a recent prosecution for the fraudulent consumption of electricity through the placing of a reading lamp on the power circuit, and obviously my Council will take the necessary steps for its protection should any further cases come to its notice.

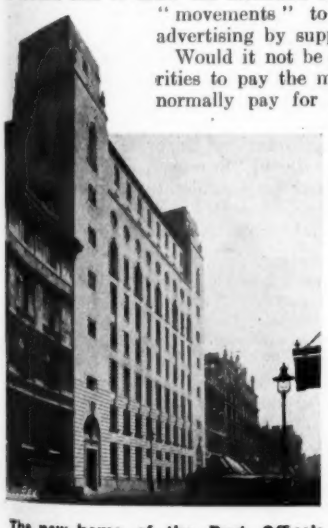
I shall be obliged therefore if you will kindly take the necessary steps at your early convenience to contradict your statement, and make it quite clear that the placing of reading lamps on the power circuit is not permissible. A. PLUCK,

Congleton, *May 1st.* *Engineer and Manager.*

Electricity Supply Movements

I understand from your leader on "Electrical Organisation" (April 28th issue) that "movements in progress in Britain are making a call upon electrical men to re-equip themselves for the work of future development." Amongst other things, I would like to draw the attention of the organisers of these "movements" to the present system of advertising by supply undertakings.

Would it not be better for supply authorities to pay the money that they would normally pay for their advertisements to some fund supervised by an Advertising Committee, say a branch of E.D.A., or of the Sales Development Association which I trust will be formed in the near future, and then instead of there being two or three advertisements of supply undertakings advertising the same product, namely, electricity, in *one* newspaper, we would have one good advertisement.



The new home of the Post Office's international exchange at Faraday Building, Queen Victoria St., E.C.4, which was opened yesterday (Thursday)

Another question that I would like to emphasise, and one which I think interests quite a few young engineers, is: Is the selling of electricity going to be left in the hands of lady demonstrators? I have noticed with considerable misgiving the growing tendency of supply authorities to staff their showrooms with lady demonstrators only. These young ladies deal with all inquiries from wiring to water heating, and the installation of small motors, &c.

Having listened with considerable interest to Professor Marchant's presidential address to student members of the I.E.E., and noted that he laid considerable stress on the fact that the brightest prospects for young electrical engineers lay chiefly on the sales side of supply undertakings, I am now wondering whether the majority of these positions will not be held by lady demonstrators.

As cooking demonstrators, ladies are, of course, excellent, but as saleswomen, and technical advisers to the consumer, I doubt whether they are as efficient as the man who spends much of his leisure in swotting, and generally educating himself in the uses and wonders of electricity in the hope that one day he will gain his reward—a steady job with a reasonable salary—which will enable him to keep—well who knows?—maybe a lady demonstrator. A. C. H.

May 1st.

A striking picture of Luna Park, Paris, demonstrating the artistic possibilities of neon tubing

The Electrical Association for Women

With reference to the recent correspondence in the ELECTRICAL REVIEW, I think that "Member" has not realised, as the majority of the "demonstrator members" have done for some years past, that the E.A.W. is not intended and does not cater for those engaged in the electrical business, but for women who have plenty of time on their hands and supplied with funds by their husbands, most of whom hold important positions in the electrical industry. The visits to works, supply stations, and showrooms are all arranged at such times that it is impossible for a demonstrator to attend, without asking favour from her chief.

The training of further electrical demonstrators will merely add to the competition that now exists, as there are hundreds of applicants for every job advertised (most of them being out of work), and the salaries offered in most cases are not remunerative—unless the demonstrator happens to live with her people in the district.

Further, "Member" has not taken into consideration the fact that the majority of people attending any E.A.W. social function, especially the annual ball, are manufacturers' representatives and their women folk. A LONDON MEMBER.

April 28th.

I heartily concur with "Member's" contributions of April 7th and 28th. I must refer the Director's supporting member to the claim made by our Association, *i.e.*, the low subscription of 5s. to which should be added 12s. 6d. for copies of the *Electrical Age*, the Association's official organ, which is sold to members optionally. Surely those interested in the Association's work would prefer to pay an annual subscription of 11s. inclusive of the *Electrical Age* which is generally left on sale on electricity showroom sales counters.

I, like "Member," cannot afford to attend the Association's special functions and cannot find sufficient influence to enable me to acquire a special demonstrator's job, necessitating visits to London, &c. My duties do not afford me the time, apart from the out-of-pocket expenses, necessary to visit the Association's London headquarters, and I entirely agree with "Member's" contention that too much time and money is being expended on social functions which does not enable the hired-wiring consumer to take even a small part in the Association's branch activities.

I daily meet hired-wiring and potential consumers of electricity and hear them express the view that it is not possible for them to join the Association despite the low subscription claimed. I suggest to the Director that the branches should give more practical assistance to the ordinary and potential consumers and not tell the public such things as that electric cooker fuses can be renewed by the user, which is entirely a misleading statement and very discrediting to the work of our Association. EXPERIENCED LADY DEMONSTRATOR.

April 30th.

Those who carry the brunt of the work of national organisations are familiar with the parochial type of mind exemplified by "Member," that is more ready to give anonymous abuse, than help in livening local activities, and so preventing or overcoming the matters they complain of.

One can see "Member's" chagrin in discovering that her 1½d. a week subscription does not entitle her to a £5 journey to London, but she doesn't *have* to be a member so why doesn't she withdraw this financial support of hers if she is dissatisfied?

If she adopts my suggestion I do hope that the E.A.W. may not completely collapse at the loss, not only of the financial support, but the moral support of such a loyal member as your correspondent. VEDA BRICE.

Beckenham, *April 29th.*

The Eastbourne Electricity Undertaking

Recommendations of a Special Contracts Committee

IN December last, the Eastbourne Council appointed a Special (Electricity Contracts) Committee to investigate and report upon a number of matters. Some of these have already formed the subject of proceedings in the Courts (ELEC. REV., April 7th, p. 496, and April 14th, p. 527).

The Committee has issued its report dated April 24th, after holding seventeen meetings. The contract position is reviewed, also the circumstances under which Mr. Hawtayne resigned his appointment as consulting engineer and was subsequently reinstated, and the difficulties under which the borough electrical engineer was working. We make the following quotations from the closing part of the report and print the recommendations which are made by the Committee.

It is stated that in several cases the "minutes were not so complete or informing as to enable the Council to come to a right decision upon the [Electricity] Committee's recommendations." "The real influence behind the Committee's actions came from the chairman and the deputy electrical engineer." We quote the closing paragraphs (16, 17 and 18):—

"So far as the borough electrical engineer is concerned we consider that he has not exercised sufficient authority over his department and that he should be responsible to the Council for the work therein. We are also aware that on many occasions his position was made extremely difficult by reason of the very close relationship between the chairman and the deputy engineer before referred to, but we do not think this a sufficient reason for permitting reports in his name and with which he did not agree to be presented to a Committee without protest.

"Taken over the whole period, however, we think that he has been through an extremely difficult and embarrassing time and we hope that he will profit by this experience and keep a stronger hand on the undertaking for which he is responsible."

"The actions of the Electricity Contracts Sub-Committee and the Electricity Committee with regard to the placing of contracts appears to us to have been thoroughly unbusinesslike, and in this connection they cannot evade their responsibility; and their instructions appear to us to be indefensible and contrary to proper municipal procedure.

"We feel compelled to refer specially to a particular incident that came before us. In June, 1932, just before the borough electrical engineer was going for a holiday, he received a letter written by the town clerk at the instigation of the chairman and apparently the deputy-chairman of the Electricity Committee, which, coupled with a conversation subsequent to his return, was tantamount to giving him notice. It is obvious that the tactics of the chairman were to get rid of the consulting engineer, and the borough electrical engineer, and then to make the deputy borough electrical engineer chief. We cannot condemn too strongly this sort of action by individuals without the knowledge of the full Committee or the Council and if permitted it would simply mean that no chief official would have any security and reduce ordinary municipal government to chaos. Such procedure is intolerable."

The Committee's recommendations are as follows:—

"1. With regard to any contracts entered into by the Town Council as the Sanitary Authority, the Public Health Acts require that if the amount exceeds £100, tenders must be invited by public advertisement, and although this requirement is not contained in the Electricity Acts, we think that the Council should apply the same rule to all contracts to be entered into by the Corporation. The practice of inviting selected firms to tender or of allowing subsequent tenders to be put in after original tenders have been formally considered by the Committee should cease, although we see no objection to any firm being informed of the fact that an advertisement has been issued.

"2. The minutes of committees should be framed, particularly in the matter of contracts, so that the Council may be put in possession of the full facts, and they should not be so condensed as to omit information which ought to be in the possession of the latter.

"3. We are of opinion that the standing order of the Council to the effect that no chairman should serve in that capacity for a longer period than two years is one which should be strictly enforced in the future. We believe that the Council when they made that standing order had good reasons for passing it and we think that what has happened recently confirms the wisdom of their action. Departure from it is calculated to make individuals acquire an undue influence and to think that they are indispensable.

"4. In conclusion, we recommend that in future the borough electrical engineer must be responsible for the Electricity Department subject, of course, to carrying out the instructions of the Electricity Committee and the Council."

The Committee presented its report to the Council on Monday, but on the motion being put that the report be received several members protested that it was only in their hands on Saturday, and that not only had they not had time to study it, but there had been no opportunity for those it condemned to put their side of the case.

Alderman C. J. Knight, Councillor Edgar Hill, and Councillor G. F. Christie, who signed the report, defended it, but the Council agreed to defer its consideration to a special meeting in order that those concerned might have an equal opportunity with the Special Committee of stating their case.

A Baker's Testimony

IN a paper on "Baking by Electricity," read at the May meeting of the Master Bakers' Association, Mr. W. S. Morrison stated that, while he could not speak from expert electrical knowledge, as a practical baker he was thoroughly satisfied with the result of converting his bread bakery to electrical working. He had found that he could get sufficient heat from electricity in a shorter period than from any other fuel; there were also the advantages of cleanliness, freedom from smell, and non-consumption of oxygen.

The chief obstacle to the more general adoption of electricity for baking had been the running cost, but with the lower rates now quoted for off-peak working larger baking ovens were being increasingly used.

The arrangement of the elements so as to give additional heat near the oven door, coupled with complete temperature control, enabled him to produce an evenly baked batch. Valuable space had been saved, and when building extensions were being made the oven could be moved to a more convenient position without structural alterations. The time switch often saved an hour in the morning.

Each of his own G.E.C. electric ovens, occupying less than half the space of his old side-flue ovens, was equal in capacity to one of the brick type, but with continuous baking would do more than two of the latter in the same time. More than four times the output of the four former brick ovens could be obtained for the same floor area. Steam injection was supplied to both the electric ovens from a small electric pressure boiler, fitted with two 1-kW immersion heaters and fed with hot water from a 75-gal. electric storage tank. The dough mixer and dough divider were both electrically driven, and the waxed paper on the bread-wrapping machine was electrically heated.

Mr. Poole, in thanking Mr. Morrison, said that after seeing the installation described he had decided to install a similar one. After two years' experience he had had no reason to regret his choice.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Small Neon Pilot Lamps

On May 20th, 1932, we described an indicator lamp rated at 1/10 W made by the "ELSICO" GLOW LAMP INDICATOR CO., 81, Milton Street, Sydney Avenue, E.C.2, for use with wall switches. This idea has now been developed further and the same type of lamp is now available for several other uses. One model can be used as a pilot light on a flexible lead, while another can be fitted to the wall to indicate when one part of a circuit is "alive"; the latter should be particularly useful in factories and battery-charging depôts. Other types are suitable for a screw batten fitting and for use with any particular apparatus to indicate when it is "on": this application is easily adaptable to domestic irons, immersion heaters, and vacuum cleaners, &c., which are sometimes controlled by a switch in the body of the appliance. The price of all models is approximately 4s.

One of the new "Elsico" pilot lamps

A Theatre-lighting Dimmer

Of the several novel features pertaining to the "Quead" theatre-lighting dimmer recently produced by MESSRS. WILLIAM GEIPEL, LTD., Vulcan Works, 156-170, Bermondsey Street, S.E.1, probably the most notable are its very robust and fireproof construction, particularly with regard to the resistance units; its unusually compact housing of the units, coupled with provision by large surface area for very rapid heat dissipation; and the easy accessibility of the parts for repair, &c.

The apparatus is of circular cast-iron plate construction and is designed for edgewise banking at 4½-in. centres. No slate or composition insulation is used in the equipment, and except for the contacts and actual resistance material the whole is built entirely of mica, steel and iron. About 100 resistance units are accommodated in two rows in concentric formation within a housing measuring 17 in. in diameter and 1¼ in. from back to front.

The units are accurately graded for flickerless dimming, and each one is made up of nickel-chrome strip wound on a mica former, the whole being enclosed in a flat steel case provided with rigid lugs so arranged that the unit can be mounted direct on the contact studs. The resulting elimination of wire stud and unit connections is all-important, as is the obvious ease with which the unit can be replaced. A separate unit is provided for each step. The mica bushing of the very large area studs in the cast-iron plate all contribute to a sound engineering job.

The collector brushes, of the spring-influenced plunger type, are specially constructed for smooth working at comparatively high temperatures, and are self-aligning and self-lubricating. The brush holders are mica bushed into and shrouded by the "dead" and earthed contact arm which is driven by a substantially constructed quadrant with machine-cut gears.

A quick make-and-break switch opens the circuit in the "dim" position. The circular resistance housing and the hand-operating mechanism are mounted in a channel-iron base.

The "Handy Lamp"

The "Handy Lamp"

The "Handy Lamp" illustrated herewith is a new product of the MEK-ELEK ENGINEERING CO., LTD., 57, Victoria Street, S.W.1. There is a nickel shield around part of the bulb so that the user is not dazzled by the light. The base is supplied in red, blue, green or black, and measures 5 in. in diameter. The lamp is priced at 10s. 6d. without bulb and is 7¼ in. high.

Resin-cored Solder

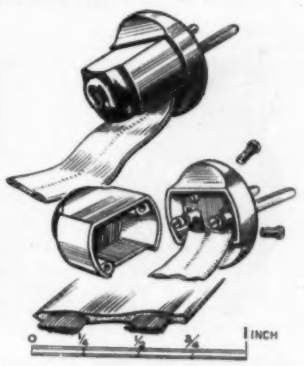
There are innumerable soldering jobs needed in the home that can be done by the handy man with the aid of "Solon" resin-cored solder. The solder complies with B.S.S. No. 219 (Grade F.), which specifies 50 per cent. lead and 50 per cent. tin with pure resin as the flux.

The hollow of this solder contains the correct quantity of resin, which, having a lower melting-point than the solder, flows on to the work before the latter, thus forming an adequate flux. It is produced by MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1.

A Flat Flexible

It is not uncommon to find that one wants to use a table lamp or wireless set at the opposite corner of the room from which the switch-socket is situated. This necessitates the use of a long flexible to go round the skirting or under the carpet. The latter procedure is certainly unwise, and the other method is untidy.

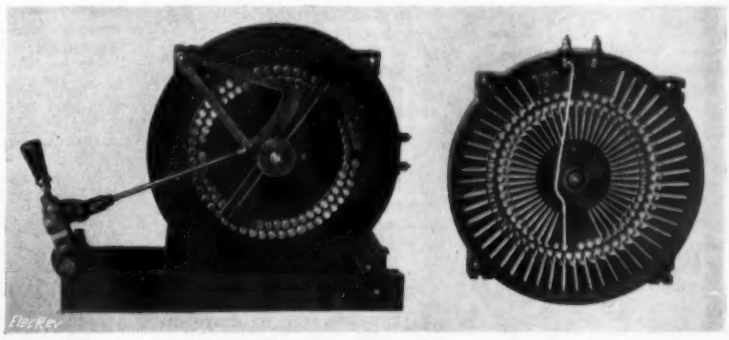
MESSRS. MAY, WRIGHT & CO., 52, Ivanhoe Road, S.E.5, have shown us a flat flexible which is about to be placed on the market. With this there is no chance of a "short" through constant treading on the flex, and it can be obtained in all standard sizes. The construction and size are shown in the accompanying illustration; it is obviously much less unsightly than round flex when fixed to a wall.



The new flat flexible

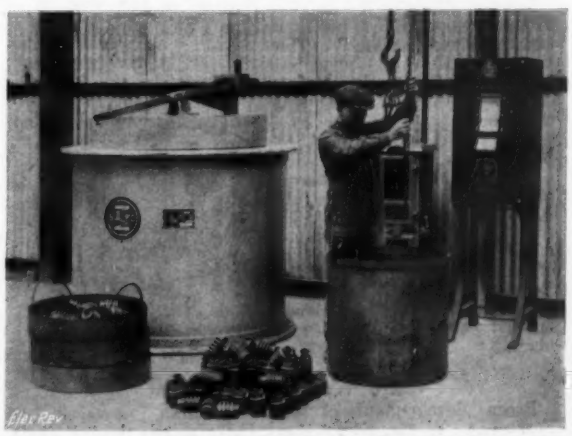
Low-temperature Heat Treatment

A new range of electric resistance furnaces for low-temperature heat treatment processes (up to 700 deg. C.) has been developed by BIRMINGHAM ELECTRIC FURNACES, LTD., Birlec Works, Tyburn Road, Erdington, Birmingham. The method depends upon the practical elimination of radiation for heating the metal, heat being automatically transferred from the elements to the charge by the forced circulation of air at a rate and with a temperature uniformity which, it is claimed, have been previously obtainable only by the salt-bath type of equipment.



The "Quead" theatre-lighting dimmer: a front view of the complete unit, and the back of the resistance housing (cover removed)

The furnace comprises essentially a cylindrical heat-insulated chamber, with an inner metal cylinder to accommodate the work basket. The heating elements are mounted in the annular space between the insulated wall and the container, which prevents direct radiation of heat on to the charge and confines the circulating air to a definite path. Circulation is continuous—no fresh air being drawn into and no hot air expelled from the chamber. The powerful circulation of air (upwards over the elements and downwards through the

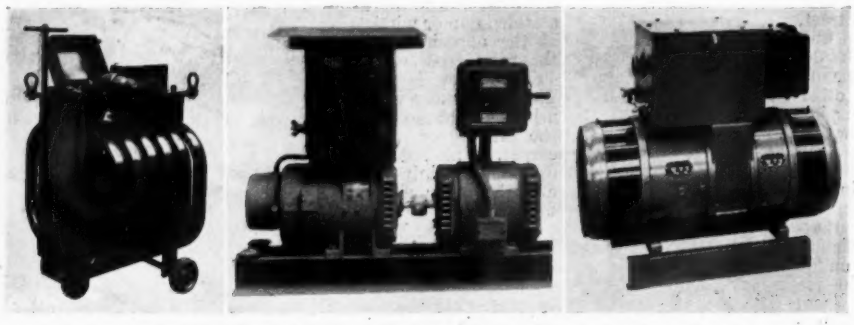


One of the new "Birlec" furnaces

D

charge) is maintained against the back pressure due to the charge by a direct-driven fan.

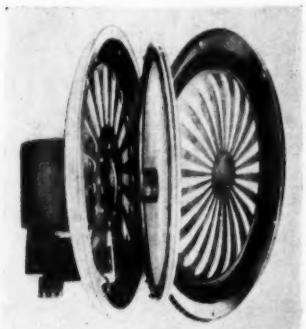
A charge-progress recorder, which also controls the temperature, is supplied as standard. This instrument operates from two thermo-couples, placed one in the incoming and one in the outgoing air stream. The temperature registered by each is indicated on the same chart, and the coincidence of the two records shows that the charge has ceased to absorb heat from the air and is uniformly heated. The method is intended for application to any low-temperature treatment requiring rapid, uniform, and accurately controlled heating, such as the tempering and secondary hardening of high-speed steels and for aluminium alloys. Four models are available with ratings of 10, 16, 26 and 40 kW, for 1-, 2-, or 3-phase working.



New Murex products: The "Polyarc" three-phase transformer welding machine, a motor-generator set for light welding, and a single-carcase equipment

An Unorthodox Loud-speaker Design

Recently we had the opportunity of listening to a loud speaker designed on unusual lines. It is of the moving-coil type, but instead of incorporating the usual conical diaphragm a flat sheet of aluminium 0.0005 in. thick is employed.



The Midgeley Leighton speaker showing the diaphragm in between the protective cover and frame

In previous experiments when this type of diaphragm has been used, it has been very large and tightly stretched so that the resonant frequency is very high, but in this case it has been brought down to the lower end of the scale by means of a metal "inertia ring."

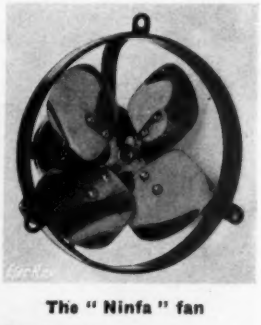
The diaphragm is stretched slightly on this "inertia ring," and the two are free to move on guide pegs, thus enabling the diaphragm to "float" within certain limits. The drive is by the usual p.m. or energised magnet and a coil fixed eccentrically to the diaphragm. The speaker is somewhat more sensitive than most similarly priced moving-coil cone speakers.

Models are available with 7- and 9-in. diaphragms, the former being priced at about 35s. The makers are MESSRS. MIDGELEY LEIGHTON, LTD., Wembley Hill Estate, Wembley, Middlesex.

Exhaust Fans

MESSRS. MARELLI & CO., LTD., 19/20, Garlick Hill, Queen Victoria Street, E.C.4, are marketing a new 6-in. exhaust fan known as the "Ninfa." The bearings are of phosphor bronze, automatically lubricated by felt pads in enclosed chambers.

The a.c. model, loaded at 28 W, has a speed of 2,100 r.p.m. with an air displacement of 100 cu. ft. p.m., while the d.c. type revolves at 2,200 r.p.m. with an air displacement of 110 cu. ft. p.m.; the loading of the latter model is 22 W. Both types weigh 3¾ lb. and are priced at 30s. finished in black enamel with polished brass blades.



The "Ninfa" fan

Arc Welding Equipment

Recent developments of MUREX WELDING PROCESSES, LTD., Ferry Lane Works, Forest Road, E.17, include the "Polyarc" three-phase transformer welding equipment, a specially designed motor-generator set for dealing with thin sheet metal, a single-carcase motor-generator set, and a portable set for permanent-way maintenance, as well as some new special-purpose electrodes.

The phases of the "Polyarc" can be used simultaneously to provide current for welding, so that the heat available at the arc is increased and greater working speeds are obtained. Two electrodes are employed, one in each hand, and three arcs result, one between each electrode and the work, and a third between the two electrodes. The machine can also be used as a two-operator set, one phase only serving each operator, but with all three phases equally loaded.

The machine for thin metal will supply each operator with from 10 to 30 A in 1-A steps. It can also be used for heavier work by connecting two or more circuits in parallel. Although it is contained in only one frame, with resulting compactness and light weight (10 cwt.), the specification for the single-carcase set is exactly the same as that of the standard Murex motor-generator set. The generator supplies a practically constant current to the arc, and the time lag in the field is so small that a reactor is unnecessary.

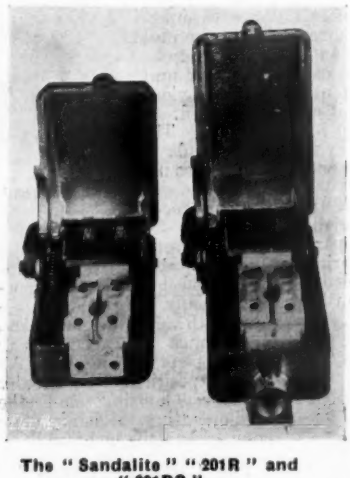
A Morris petrol "Industrial" engine (1,500 r.p.m., 16 h.p.) is employed for the permanent-way maintenance equipment, and the drooping characteristic dynamo is rated at 200 A, 30 V (70 to 80 V on open circuit). It is possible to weld continuously with a No. 4 electrode of any type. On an average the welding of a crossing requires about 60 ft. of electrode, 45 ft. of No. 6, and 15 ft. of No. 8.

Among the new electrodes is the "Fastex," which has been specially introduced for high-speed welding. The arc voltage varies from 24 to 30, and currents 50 per cent. higher than are generally used with ordinary slag-coated electrodes are afforded. Excellent root penetration is combined with the high welding speeds. "Hardex" is an electrode specially produced for hard surfacing metals. The deposit has a Brinell hardness of 640-670, and no quenching or other treatment is required. A smooth and even surface is obtained during the welding operation.

The "Sandalite" Switch Fuse

The latest switch-fuse introduced by MESSRS. WILLIAM SANDERS & CO., LTD., Falcon Electrical Works, Wednesbury, is the "Sandalite" rated at 210 V, 15 A.

The switch has a q.m. and b. action with an operating handle interlocked with the lid, so that the latter cannot be opened when the switch is "on." The contact blades are mounted on an unbreakable bar of solid insulating material, and the current-carrying parts are electro-tinned and the internal ferrous parts rust-proofed, while the case is of cast-iron finished in matt aluminium.



The "Sandalite" "201R" and "201RC"

In model "201R," for use with flexible cable, the incoming and outgoing leads can be led directly to their respective contacts, and the fixing holes are within the case, centres being 3¼ in. (or just over a standard brick width) apart, thus ensuring rapid and firm fixing. The price is 4s. 8d. each (singly), while model "201RC" (for ¾-in. conduit) costs 6s. In this case a "spout" entry is provided at the top and bottom, and locking screws are fitted for convenience when "grip" conduit is used.

A New Kettle

MESSRS. JOHN SHAW & SONS, LTD., Wolverhampton, are adding yet another appliance to their already extensive range of domestic apparatus. The newcomer is a new aluminium kettle at 14s. 6d. known as the "Grosvenor." It has a capacity of two pints and the element, loaded at 700 W, is wound with best quality michrome ribbon on pure ruby mica formers. Models are available for standard voltages (100/110, 200/210, 220/230, and 240/250), and two yards of unkinkable flex are supplied with each kettle. A side entry "Bakelite" connector and adaptor is incorporated.

The "Grosvenor" kettle

New Books

An Introduction to the Calculus, by G. VAN PRAAGH. Pp. 92. London: Macmillan & Co. Price: 2s. 6d.

This book is intended to present the main principles of the calculus to students of science in a manner as free as possible from complication. This object has been achieved, and for this reason the book will have a special appeal to candidates for examinations such as the general B.Sc. of London University, the Oxford physics preliminary, and Part I of the Cambridge Natural Sciences Tripos.

Approach to the subject is made through the usual conception of rates, involving the ideas of functions, variables, and limits. Although this treatment has been greatly condensed, it is entirely orthodox, so that the student will have nothing to unlearn when he proceeds to more detailed studies. After the introductory matter there follows a discussion of maxima and minima, and a useful chapter on partial differentials and errors of measurement containing examples from various departments of physics.

The remaining half of the book is concerned with the integration of standard functions, and a chapter on integration as the limit of a summation has been included in order to demonstrate the practical applications of the integral calculus. Several examples from electrical theory appear in this chapter. The concluding chapter on simple linear differential equations deals briefly with the solution of equations of this type occurring in connection with such subjects as the simple pendulum, growth of current in an inductive circuit, free and forced vibrations and resonance. In this section it would have been advisible to include a few notes explanatory of the theory of complex quantities, which are not sufficiently well known to warrant their use without comment in an introductory treatise. The value of the work would also have been greatly increased by references to the appropriate parts of more advanced works.

The compact form of this book and its reasonable price are strong recommendations for its extensive use by students.

Windmills for the Generation of Electricity, by C. A. CAMERON BROWN. Pp. 15; illus. Institute of Research in Agricultural Engineering, University of Oxford. Price: 1s.

This small book is a summary of a report issued in 1926 by the Institute, with the addition of short sections on wind characteristics, types of wheels, and the present position of the windmill for generating electricity. Particulars of the windmill plants supplied by various makers are also included. The range of useful wind velocities is from 8 to 25 m.p.h. The most critical calm period of the year can be met by providing storage facilities capable of maintaining the yearly average for about three or four days. The cost per kWh varies between 4d. and 12.7d. with generators rated at from 0.25 kW to 10 kW giving an output (after deducting battery losses) of from 368 to 7,690 kWh per annum. The capital costs of the windmill plant (including batteries) range from £120 in the smallest size to £900 in the largest.

Vector Analysis, by H. B. PHILLIPS. Pp. 236; illus. London: Chapman & Hall. Price: 15s. 6d.

This important branch of mathematics is largely based on the original work of two British mathematicians, Hamilton and Heaviside, and has been a weapon of the greatest potency in the hands of modern investigators in their development of the science of mathematical physics. The basic conceptions of the vector calculus are, at first sight, quite simple. Few, however, but the mathematically minded find it possible to acquire a working familiarity with this calculus, and it is due to this fact that modern theories regarding space and time are so little intelligible to those who have received an average scientific education. Dr. Phillips's treatise is an excellent work for those with the requisite intellectual qualifications who desire to obtain a sound knowledge of the elements of this subject.

The author commences with a clear exposition of the rudiments of the vector calculus, and assumes no greater knowledge of mathematics in his readers than is obtained in the normal engineering college course. The first part of the book deals with the basic properties and the manipulation of vectors and with the elementary properties of scalar and vector fields. The remainder of the work is devoted to more advanced treatment of fields and to the properties of potentials and linear vector functions. At the end of each chapter there is an ample collection of examples to be worked out; the utility of the book for the student would, however, have been considerably increased had the author added an appendix giving the solutions of the problems and hints for the proofs of the theorems. The general style of treatment is distinctly formal, and the work is likely to appeal only to those having a real aptitude for mathematics. The production of the work has been excellent, and it is a real contribution to mathematical literature.

Recommended Methods for Sampling and Analysis of Cast Ferrous Metals and Alloys. Pp. 44; fig. 1. Birmingham: British Cast Iron Research Association. Price: 10s. 6d.

The rapid exhaustion of the first edition of this publication, which was issued in 1929 as Research Report No. 72, is indicative of its usefulness. In this second edition there have been incorporated methods of estimating the presence of special elements in the materials of which castings are made or added during manufacture. The mode of operation in the case of a complex alloy containing a small quantity of nine special elements is outlined.

The principal reactions involved are stated after each of the methods recommended, which are applicable without change to all foundry irons, including steels. The procedure described has not been elaborated beyond the requirements of the trained works chemist, being intended solely for use in conducting raw material acceptance tests and manufacturing process checking, leaving the research investigator free to choose ways and means best suited to his particular circumstances. The increased size of this edition has necessitated the transfer of recommendations relative to the sampling of coke, coal dust, &c., to a second edition of Report No. 73 on the examination of foundry fuels, which is to be issued at a later date.

Electric Circuits, by F. H. TAYLOR. Pp. 99; figs. 70. London: Percival Marshall & Co., Ltd. Price: 2s.

This little book is largely comprised of blue-print diagrams of simple circuits for bells, telephones, lights, and motors, including connections for starting. On the page opposite each diagram is a brief but usually adequate explanation of a practical character. The book will be useful to wiremen and those interested in elementary installation problems.

Shorter Notices

"South African Mining and Engineering Year Book," 1933, pp. 375+132, price 12s. 6d. (in England), and the "Rhodesian Mining and Engineering Year Book," 1933, pp. 144+128, price 12s. 6d. (in England). Both these works (obtainable in England from the Argus South African Newspapers, Ltd.) consist of two sections, the year book section, which deals separately with the progress in many different areas, and the directory section. The South African year book contains a separate electrical section of 70 pages, including a map of the areas of the different undertakings.

"The B.O.C. Handbook for Axy-Acetylene Welders." Pp. 220. London: The British Oxygen Company. Price: 3s. 6d. There are a number of firms in the electrical world who still employ the oxy-acetylene method of welding, and to them this book is likely to be of considerable use as it is a comprehensive and practical guide. A useful appendix is provided, and consists mainly of tables relevant both to oxy-acetylene and electric welding.

"Les Machines Electriques et la Prédétermination de leur Puissance Spécifique Maximum," by J. Rezelmann. Pp. 58; figs. 16. Leipzig: B. G. Teubner. Price: Rm. 2. This book (which is in French) deals with the calculations for ascertaining the maximum ratings of small and large d.c. motors, synchronous motors, two-pole turbo-generators and transformers. It is both theoretical and practical, and the subject is dealt with in a simple way.

"Laxton's & Lockwood's Builders' Price Book." 116th edition. Pp. 912. London: Kelly's Directories, Ltd. Price: 7s. 6d. Minor rearrangements have been carried out this year to make information more accessible, and the paging of the book has been simplified. The "Proprietary Articles" section has been improved, and new wage scales which came into force last February have been included.

"Sonderdruck der Ubungsaufgaben mit Lösungen aus Abraham-Becker Theorie der Elektrizität," Band I, 9 Aufl. B. G. Teubner, Leipzig. Price: 1 Rm. This pamphlet is a reprint of the 101 exercise problems and solutions from the ninth edition of Vol. 1 of the well-known Abraham-Becker treatise on the theory of electricity.

"Anglo-American Year Book." 1933. Pp. 490. London: American Chamber of Commerce. Price: 10s. The new edition of this useful work incorporates an enlarged classified trades list comprising approximately 8,500 firms engaged in Anglo-American trade.

"Code of Protection against Lighting." Parts I, II, and III. Pp. 93. Washington, U.S.A.: Government Printing Office. A complete survey of the methods of protection against the danger of electrical storms.

"Wireless Telegraphy and Telephony," by W. Greenwood. Cambridge: University Tutorial Press. Price: 5s. 6d.

"Industrial Electric Heating," by N. R. Stansel. London: Chapman & Hall. Price: 31s.

"Industrial Electric Motor Control Gear," by W. H. J. Norburn. London: Sir Isaac Pitman & Sons. Price: 10s. 6d.

"A Short Way with Unemployment," by C. C. Garrard, Ph.D., M.I.E.E. Pp. 44. Birmingham: Cornish Bros., Ltd. 1s. net.

"Données Numérique d'Electricité, Magnétisme et Electrochimie." Paris: Gauthier-Villars et Cie. Price: £2 8s.

"Thermodynamics Applied to Heat Engines," by E. H. Lewitt. London: Sir Isaac Pitman & Sons. Price: 12s. 6d.

"Aeroplane Design," by R. Rodger. Pp. 159. Illus. with tables. London: The Draughtsman Publishing Co. Price: 6s.

"L'exploitation des Chemins de Fer," by H. Forty. Paris: *Le Génie Civil.*

The National Register

THE annual general meeting of the National Register of Installation Contractors was held at the Institution of Electrical Engineers, London, on Friday, Mr. P. V. Hunter (chairman) presiding. The report of the Executive Committee and the accounts (see last week's issue, p. 603) were adopted, and the following nominations to the Registration Board were agreed to:—Mr. H. Bannister, nominated by the Central Electricity Board in place of Mr. J. A. Lee; Mr. L. C. Penwill, instead of the late Mr. W. A. Shaw (Electrical Contractors' Association); Mr. A. B. Wildsmith, instead of Mr. D. Foster (Electrical Wholesalers' Federation); and Mr. T. W. Heather, instead of Mr. H. W. Roberts (British Electrical and Allied Manufacturers' Association). Mr. P. V. Hunter and Mr. A. H. Dykes were unanimously re-elected chairman and vice-chairman respectively, the latter being congratulated on his recent recovery from illness.

The amendments to Rules 6-10 (e) and 11 recently adopted by signed resolution, were confirmed, and the motion authorising the amendment of the standing orders to permit architects to be represented on Local Advisory Committees was carried unanimously. In the latter connection Mr. H. J. Cash stated that it was felt that architects could be very useful on the Committees and, further, would take more interest in the Register if they were connected with it.

Messrs. Cash, Munro and Walker were all re-elected to the Executive Committee, Mr. Bannister taking the place of Mr. Lee. Speaking of the appointment of Mr. H. C. Hazel as full-time electrical inspector, Mr. Cash said that this step was made necessary by the reluctance of contractors to send information regarding delinquencies. Complaints received were far too few, and it became necessary for the Inspection Committee to get its own information. Local Advisory Committees were now being asked for lists of up to about 25 per cent. of the contractors in their areas most suitable for inspection. In two and a half weeks Mr. Hazel had inspected twenty-one firms' work and so far had found a very general readiness to put things right where necessary. It was mentioned by the chairman that it might be necessary to call an extraordinary meeting in about six months' time in order to sanction an increase in certificate renewal fees.

The Electrical Industries Benevolent Association

ON Friday last the annual general meeting of the Electrical Industries Benevolent Association was held at the Institution of Electrical Engineers, London, Professor Marchant (president, I.E.E.) taking the chair. The Council's report and the accounts (see last week's issue, p. 607) were passed, and Mr. R. P. Sloan, Sir Andrew Duncan, Sir Felix Pole and Mr. Geo. Balfour were elected members of the Council; Messrs. A. G. Beaver, J. Y. Fletcher, E. A. Gatehouse, L. C. Penwill, and S. D. White, the retiring members, were re-elected.

[*Elliott & Fry*

Lord Meston, the new president of the E.I.B.A.

The retiring president, Mr. R. P. Sloan, congratulated the Association upon having secured Lord Meston as its next president, and also the various branch centres on having obtained eminent men as their local patrons. During his year of office, said Mr. Sloan, he had had opportunities of realising the value of the work which was being carried on by the Association. This had more than ever impressed upon him the fact that if the pathetic circumstances of many to whom the Association brought relief were fully realised, the response made to appeals for support would be much more generous. While many of them had enjoyed employment for many years and had every hope of continued employment, the day might come when, for one reason or another, they might find themselves "up against it." Even with the present conditions he could not but feel that the support which the Association received was far short of what might reasonably be expected, the income from subscriptions and donations averaging during recent years about £3,500 per annum only.

When one considered the magnitude of the electrical industry—the electricity supply section alone in the year 1930-31 represented a capital expenditure approaching £355,000,000, had a revenue from the sale of electrical energy of over £52,000,000, and gave employment to nearly 65,000 persons—the present contributions to the funds of the Association were indeed insignificant. There must be ten times the present number eligible for membership and he would like to see some real effort made to have this increased. As the result of a personal effort, in ten days or so he had obtained no fewer than 279 new applications for enrolment from his own staff and others were still coming in. This gave an indication of what could be done if those holding the higher positions in works and electricity supply undertakings would personally take a little trouble in the matter.

The Work of the N.P.L.

DURING 1932 the severe trade depression experienced in all branches of industry was felt at the National Physical Laboratory. The aggregate number of tests carried out declined by 4,187 to 46,248, excluding clinical thermometers, and economies had to be made by deferring schemes of development and the installation of equipment, and leaving unfilled vacancies on the staff. Nevertheless, the annual report (H.M. Stationery Office, 1s. net) shows that steady progress has been made. Additions include new acoustic laboratories which are of unique design. The maintenance of the standards of measurement demands continuous international co-operation to preserve the great accuracy, in most cases a few parts in a million, which is to-day necessary. The eighth general Conference of Weights and Measures is to be held this autumn, and recommendations will probably be put forward by the Consultative Electrical Committee in connection with electrical units.

Many industrial processes require not only a furnace in which high temperatures can be maintained, but one in which the precise degree of heating is under control. It therefore becomes essential to have some standard scale to which very high temperatures can be referred, and one of the points which serve to fix this scale at the higher temperatures is the melting point of platinum. Whereas tables published less than fifty years ago gave estimates of this melting point varying from 1,460 deg. C. to 2,534 deg. C., an investigation now proceeding is expected to result in a value reliable to about 2 deg. C.

The measurement and control of moisture in the air are rapidly growing in importance in many industries. Below zero C. the wet bulb becomes coated with ice, and the difference between the wet bulb and dry bulb temperatures becomes extremely small, so that the instrument is not very accurate at low temperatures. An effort to remedy this defect is being made by the development of electrical methods for measuring directly the difference between the temperatures of the wet and dry bulbs.

The Applications of X-rays

International agreement has existed for some time on the method to be used for measuring the dose of X-rays given to a patient. The standard instruments set up at the Laboratory and in America for the evaluation of the recently adopted unit of X-ray quantity—the "Röntgen"—have been compared during 1932 and found to agree in their indications to within ½ per cent. These standard instruments are not, however, conveniently portable, or suitable for routine measurements. Other forms have therefore been devised at the Laboratory which can be compared with the standard, and are at the same time light and handy to use. Perhaps the most striking of all the applications of X-rays to industry is the discovery that the special magnetic qualities required in the steel used for electrical transformers depend entirely on the perfection of the individual crystals in the steel. No method other than X-ray examination is known by which the degree of perfection can be even approximately estimated.

The X-ray method of investigation is in constant use for the determination of the structure of metals and alloys and of the changes which they undergo during thermal and mechanical

treatment. The equipment has been extended by the addition of an apparatus for applying the method of electron diffraction to metal surfaces; this is equivalent to using rays of a very much shorter wave-length than X-rays, and has the advantage that as the penetrating power of the ray is very small it is possible to study the structure of surface films independently of the underlying metal.

Radio-frequency Research

International comparisons of standards of radio-frequency are carried out and the recent rapid development of this work has led to the construction of a new installation. The transmitter is now being tested and calibrated for use in researches on the ionisation of the upper atmosphere, and also for the emission of waves of standard frequency. It is equipped for making small changes in the frequency of the emitted wave by means of automatic mechanism. An alternative device emits small pulses of wireless waves at intervals which are accurately controlled by the frequency of the electric power supply feeding the transmitter. A cathode-ray oscillograph is incorporated for visually observing the type of wave emitted. The whole transmitting station is provided with four aerials for the different wave-length ranges from 50 to 1,000 metres, a switch being used on the transmitter itself to change the aerial connections.

Investigations have been in progress during the last year or two on the propagation of ultra-short waves (wave-lengths 1-10 metres) along the ground. Experiments have been carried out to determine the nature of the reflection of short electric waves from the ground, and thus to obtain a knowledge of the electrical properties of the ground itself. Research is also in progress on the production of wave-lengths less than 1 metre. Several of the older types of three-electrode valves are suitable for the production of wave-lengths of the order of 60 cm., when the electrode voltages of the valves are suitably adjusted. Some of these valves have given wave-lengths as short as 15 cm. when used in the above manner.

The traffic signals now generally used in most large towns are being standardised in form. Experimental work has been undertaken on the characteristics of the beams given by the lights both indoors and on the experimental road at the laboratory. Existing conditions as regards the lighting of various docks have been studied and a report has been prepared containing recommendations on the subject.

Over 100 technical papers dealing with the work of the N.P.L. were published during 1932, but it appears that the activities of the laboratory are not sufficiently well known in the provinces. Remedial measures are already being taken and an effort is being made to secure personal staff contact with various industries, which will assist in making known the results of researches and so pave the way for their practical application.

Parliamentary Notes

(BY OUR SPECIAL REPORTER)

ON April 25th Mr. H. Williams asked the Secretary of State for Foreign Affairs whether he was able to supply further information in respect of the discrimination against British firms in connection with the contract for the electrical installation at the new buildings of the League of Nations at Geneva.

Sir John Simon said he had made further inquiries and was informed that the specifications for the electrical installation contained no reference to German or Swiss firms by name, although it was true that certain essential parts of the equipment, which must of course conform to Continental practice, were in fact made only by such firms. He was, however, also informed that certain British firms had experienced no difficulty in obtaining quotations for these foreign specialities. It was clear, therefore, that British firms, as such, were not debarred from submitting their tenders for the electrical installation.

The St. Helens Corporation Bill

The position of the Lancashire Electric Power Co. in the St. Helens area was considered on April 26th by a Select Committee of the House of Commons presided over by Sir Henry Cautley, K.C. The Committee had before it a Bill promoted by the St. Helens Corporation for the extension of the borough by the inclusion of the parishes of Windle and Eccleston now in the rural district of Whiston. One of the clauses in the Bill provided that Acts and Provisional Orders dealing with electricity supply in the borough should apply in the added area.

Mr. S. J. Turner, K.C., for the Corporation, explained that in 1900 the Lancashire Electric Power Co. obtained certain limited powers over a large area south of the Ribble. The company could give a bulk supply to a local authority or electricity company or supply direct to customers if it obtained the necessary Order. In 1901 the company signed an agreement with the St. Helens Corporation undertaking not to oppose any borough extension and to sell all distributing or trunk mains in any area added to St. Helens except trunk mains supplying other areas. Later the company obtained another Act giving it greater powers of supply subject to the consent of any local authority or company which had already powers of supply. Counsel submitted that as soon as the area became part of St. Helens the power of veto automatically passed to St. Helens Corporation.

Mr. Craig Henderson, K.C., for the Lancashire Electric Power Co., said the question at issue was one of interpretation of an Act and it ought to be left to a legal tribunal. He submitted that the proper way to deal with it was to insert words providing that nothing in this Bill should repeal, alter or diminish any of the rights, powers, privileges or liabilities vested in or imposed on the Lancashire Electric Power Co. The company did not seek any advantage, but it did not want to be put at a disadvantage, and the suggestion he made would leave the question of law to be determined later.

After further discussion the Committee ordered the insertion of a proviso that " nothing in this sub-section shall affect the operation of Section 5 of the Lancashire Electric Power Act, 1906."

Another clause opposed by the Lancashire Electric Power Co. sought to authorise the Corporation to give bulk supplies of electricity to neighbouring authorities. Mr. W. S. Johnson, borough electrical engineer, gave evidence in support of the clause, and Mr. Craig Henderson asked what use the clause would be to the Corporation. Mr. Johnson said that it would enable the Corporation in case of difficulty to give assistance to surrounding undertakers with the consent of the Electricity Commissioners.

The chairman asked what power this clause would give which the Corporation had not already. Mr. Turner said that in order that a bulk supply agreement might become operative there must be found somewhere power to give a supply and a reciprocal power to take a supply. It might be that an Order for giving a bulk supply could only be made under the Act of 1909, where a reciprocal power to take could be found. This clause was intended to be reciprocal in itself.

The Committee ordered the clause to be deleted

In the Courts

IN the Chancery Division on April 26th Mr. Moritz, K.C., mentioned to Mr. Justice Luxmoore the action brought by Marconi's Wireless Telegraph Co., Ltd., against Philips Lamps, Ltd., a patent action which, in the ordinary course, would have been heard by the judge last week.

Mr. Moritz said he appeared for the defendants with Sir Stafford Cripps, K.C., but a difficulty had arisen owing to Mr. Whitehead, K.C., who represented the plaintiffs, having contracted influenza abroad, and he could not be back for a fortnight. The defendants had had a number of Dutch experts here for some time and he wanted the action to come on as soon as possible.

After some discussion it was agreed that the action was not to come into the list for hearing until May 3rd with liberty to either side to apply if anything supervened in the meantime to render further postponement necessary.

Damage to Insulators

At Northampton Divisional Court on April 26th eight Northampton lads were found guilty of wilful damage to insulators carrying overhead supply cables, belonging to the General Electric Co., Ltd., and the Central Electricity Board at Hardingstone. Mr. J. B. E. Campion, the magistrate, said that Kettering, Market Harborough, Burton Latimer and the adjacent villages would have had no electricity if the defendants had broken two insulators on the same line instead of one. One lad was remanded, two others were ordered to pay contributions towards damages, and five were bound over.

The Payment of Australian Dividends

The Court of Appeal, consisting of the Master of the Rolls and Lords Justices Lawrence and Romer, on April 26th dismissed an appeal by the Adelaide Electric Supply Co., Ltd., from the judgment of Mr. Justice Farwell in the Chancery Division granting a declaration that the plaintiffs, the Prudential Assurance Co., Ltd., as the holders of £11,000 5 per cent. " A " cumulative preference stock and £30,000 6½ per cent. cumulative preference stock of the company and all other holders on the English register of the company of those stocks were entitled to be paid their dividends in full in sterling and in England and not, as the appellants contended, in Australian currency or its equivalent.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Another Large Transformer for Barking

The second of two 93,750-kVA transformers for Barking power station has been completed, and was transported to site from the works of the Hackbridge Electrical Construction Co., Ltd., at Walton-on-Thames, Surrey, during last week-end. These two units are claimed to be the largest power transformers in the world, and each one is 93,750 kVA, three-phase, 50 cycles, 12,500 V mesh/33,000 V star, with tappings on the h.p. side, controlled by an off-load tapping switch, providing voltage steps of plus and minus 2½ and 5 per cent. The tapping switch weighs over a ton. Full-load currents in the h.p. and l.p. windings are 1,640 and 4,330 A respectively. The core is of five-limb construction and the windings are of the spiral type, the weight of the core being over 75 tons and that of core and coils over 95 tons. In the windings there were used in each case approximately forty-three miles of copper conductor,

The second 125,000-h.p. Hackbridge transformer on its way to Barking power station

fifty-three miles of insulating tape, and over an acre of press-board insulation. Forced-oil cooling is employed, approximately 6,000 gallons of oil per transformer being in constant circulation. The oil cooling installation of each transformer is divided into two sections, each of these sections being complete with its own oil- and water-circulating pumps. Up to half load only one transformer cooling section operates, but above this load the second section also is brought into operation automatically by means of a thermostatic relay. The oil-cooling equipment was supplied by the Premier Cooler and Engineering Co. The transport and handling of such large units naturally presents no mean problem, and our photograph shows the transformer *en route*.

Exhibition of British Industrial Art

As an outcome of the report (1932) of the committee, under Lord Gorell, appointed by the Board of Trade to inquire into the production of articles of good design for everyday use, an Exhibition of British Industrial Art in Relation to the Home is to be held from June 20th to July 12th at Dorland Hall, Regent Street, S.W.1. The exhibition, of which H.R.H. Prince George is a patron, is designed primarily to show to what extent the British industrial system can produce well-designed goods suitable to modern conditions. It is being organised privately and with the approval of the Government, the British Institute of Industrial Art, the Design and Industries Association, and the Society of Industrial Artists; and communications should be made to the secretary, 19, Hanover Square, W.1.

The Hotel Lighting Campaign

A circular letter to hotels issued by the British Electrical Development Association in connection with the E.D.A.-E.L.M.A. Hotel Lighting campaign puts forward two further reasons for improved lighting, *viz.*, to enable hotels to compete with cruising holidays in "floating hotels" where lighting is unstinted, and to be ready for the "Come to Britain" movement which shows promise of a better season.

An Increase in Wages

The progressive policy adopted by Messrs. Partridge, Wilson & Co. has made possible an increase of 5 per cent. in the pay of all employés at the Davenset Works. As manufacturers of commercial accumulator plant the company has found in the past trading years that the "peak" months occur in the autumn and winter, resulting in a declining turnover as the summer approaches. To counteract this, new complementary lines, having opposite seasons, have been introduced, the most important of which is rectifying equipment for the operation of cinema projector arcs, and satisfactory results have been obtained. The employés have been promised a similar rise in October next, on condition that the quality of workmanship is not sacrificed to speed of production.

Mass Production of Garments

The Demonstration Workshop of the Manchester Corporation Electricity Department is this week demonstrating an application of mass production to the garment manufacturing trade. Eighteen individual electric-drive sewing machine benches are arranged alternately on either side of a continuous band conveyor. The principle is that each girl does a very small proportion of the necessary machining for each garment and by means of the conveyor passes the garment on to the next girl, who also has a particular job to do. A team of shirt makers provided by Messrs. Sparrow, Hardwick & Co. is trying out the new system, which results in a big saving in time and an increase in workmanship and efficiency. A shirt can be completed and ready for pressing in less than one minute. The system employs electricity to its fullest advantage, and the conveyor is driven by a small motor of about ¼ h.p. The Manchester Corporation is prepared to supply all the necessary equipment for working the system, and is anxious to secure the interest of the many garment manufacturers in the district. It considers that the system offers great possibilities to British manufacturers in competing with goods produced by low-paid Continental workers, and is at the same time a useful outlet for electrical energy.

Lighting Fittings for Low Ceilings

A novel scheme of lighting has been installed at the Rising Sun Hotel, Hazel Grove, near Manchester. Owing to the very low ceiling height of the ground floor of this building (6 ft. 11 in.), it was found advisable to install eighteen 9-in. "Hedralite" (Holophane) panels on the ceiling, with very effective results.

A Steel Conduit Specification

The third revision of the B.S. Specification for steel conduit and fittings which has been published, differs from the earlier edition in two important respects. Pressed-steel fittings are now recognised as standard in addition to malleable cast-iron fittings, and full details are given for the gauging of the screw threads on conduit and fittings. Other changes include the standardisation for the first time of boxes with multiple back-outlets, combined dome covers and hooks, and entry bushes. Small modifications have also been made to some of the dimensions for clips, pipe hooks, and other accessories. A point of some importance is the introduction of tolerances on dimensions. Copies of the Specification (B.S.S. No. 31-1933) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Battersea's 105,000-kW Turbo-alternator

The new 105,000-kW turbo-alternator set to be installed by the Metropolitan-Vickers Electrical Co., Ltd., in the Batterses station of the London Power Co. is claimed to be the largest unit yet built or under construction in this country—in fact, of no less than 40 per cent. greater capacity than the previous largest set. The turbine, which will be of the three-cylinder impulse type, will be designed for initial steam conditions of 575/600 lb. per sq. in. gauge at a total temperature of 850 deg.

F. The low-pressure cylinder will have a double-flow exhaust, a Metrovick duplex multi-exhaust being incorporated in each flow. The unit will run at 1,500 r.p.m., while the main generator will be of 100,000-kW maximum continuous rating and wound for 11,000 V. A service generator of 5,000-kW, 3,000 V, will be direct-coupled in line, the overall length of the entire unit including turbine, main generator, and exciters being approximately 120 ft. The condensers will be of the central flow type. Five-stage feed heating will be employed, comprising two low-pressure and three high-pressure heaters with single-stage effect evaporators incorporated in the system.

French Electrical Imports and Exports

The French imports and exports of electrical machinery, apparatus, and cognate goods during the past two years are shown in the appended tables. The values are given in thousands of francs.

IMPORTS.	1931. 1,000 Fr.	1932. 1,000 Fr.	Decrease. 1,000 Fr.
Dynamo-electric machines and transformers	165,877	69,290	96,587
Telegraph, telephone and other electrical apparatus	296,289	229,822	66,467
Dynamo and motor parts	273	67	206
Incandescent lamps	91,331	77,750	13,581
Arc lamps, and parts	680	211	469
Carbons for electrical and industrial purposes	11,290	7,485	3,805
Electric wires and cables	21,412	18,053	3,359
Parts of electrical apparatus	25,916	17,826	8,090
Magnets, other than electromagnets	2,447	1,132	1,315
Accumulators and parts	6,736	3,735	3,001
Dry batteries and condensers	8,414	14,264	+ 5,850
Porcelain and other insulators	7,572	3,245	4,327
Total Fr.	638,237,000	442,880,000	195,357,000
Total at 86 Fr. to £	£7,421,360	£5,149,760	£2,271,600

EXPORTS.	1931. 1,000 Fr.	1932. 1,000 Fr.	Decrease. 1,000 Fr.
Dynamo-electric machines and transformers	91,534	51,669	39,865
Telegraph, telephone, and other electrical apparatus	158,429	91,811	66,618
Dynamo and motor parts	76	1,051	+ 975
Incandescent lamps	27,458	18,445	9,013
Arc lamps and parts	2,077	708	1,369
Carbons for electrical and industrial purposes	21,081	14,544	6,537
Electric wires and cables	51,897	27,629	24,268
Parts of electrical apparatus	41,890	26,163	15,727
Magnets, other than electromagnets	178	460	+ 282
Accumulators and parts	27,062	15,982	11,080
Dry batteries and condensers	4,382	3,862	520
Porcelain and other insulators	20,252	12,171	8,081
Total Fr.	446,316,000	264,495,000	181,821,000
Total at 86 francs to £	£5,189,720	£3,075,520	£2,114,200

It will be seen that both the imports and exports show a serious decline, amounting to about 30 per cent. in the former case and over 40 per cent. in the latter.

Electrical Development in South Africa

At the annual congress of the Association of Municipal Electrical Engineers of South Africa, held recently at Port Elizabeth, the retiring president, Mr. L. L. Horrell, said there had been a remarkable development in the use of electricity within the past two years, especially of the domestic load by the smaller municipalities. Regarding the question whether British manufacturers suffered from foreign competition in South Africa because of the high standard of British Standard Specifications, sub-committees to whom the matter was referred reported that British manufacturers did not suffer adversely, as for all important contracts municipalities, mining houses, and other important industrial users almost invariably adopted British standard specifications. Mr. Horrell said that the manufacture of a grid-controlled mercury arc rectifier gave much food for thought. He wondered if the tendency in a few years would be reversion to direct current for all purposes. Transmission of electrical energy as e.h.p. direct current was now more than a possibility, with consequent elimination of surges, corona loss, and the like, while sizes of insulators and thickness of insulation material would be reduced. He referred to the hopes of amalgamation with the Electrical Development Association which had been temporarily dashed by lack of financial support owing to the depression. It was hoped, however, that the matter would soon be revived.

Sheffield Week

There is to be a "Sheffield Week" from June 25th to July 1st arranged by the Junior Chamber of Commerce. Works and shops throughout the city are co-operating.

Facilities for Long-term Credit

We have received from the Bankers' Commercial Securities, Ltd., an outline of their activities in connection with long- and medium-term credit facilities for industrial plant and equipment as well as a wide range of domestic commodities. The six specialised plans offered are designed to cover every application of extended payments to suitable commodities, and special facilities are extended to manufacturers of productive machinery and equipment, who are enabled to offer to the user terms under which the machinery may virtually be acquired out of the earnings or savings effected by it.

Japanese Electrical Imports

Home production of electric generators, motors, and transformers has had a serious effect on imports into Japan, says our Yokohama correspondent. Returns published by the Department of Commerce and Industry show that imports of this class of apparatus in 1931 amounted in value to 2,161,000 yen, a decrease of 1,732,000 yen as compared with the preceding year. Great Britain's share declined from 879,000 to 605,000 yen, the other principal suppliers being the United States with 766,000 yen (1,446,000 yen in 1930), and Germany with 552,000 yen (against 868,000 yen).

Dutch Glow Lamp Quotas

The Dutch Government has extended for six months the system under which the imports of glow lamps are restricted to quotas previously fixed. Thus the regulation will apply until November 1st.

Radio Imports and Exports

The *Wireless & Gramophone Trader* states that although the total value of radio apparatus exported and re-exported from this country during March shows an increase of £27,932 over February's figure of £97,294 it is still £20,022 below January's total. On the other hand, imports have also risen from £39,799 to £50,790. In spite of this the favourable balance of trade has increased from £57,495 to £74,436. For the first quarter of the year exports total £367,768 (as against £279,380 for the same period last year), imports amount to £138,969, and the favourable balance of trade is £228,799.

Local Exhibitions

The Northampton Electric Light Co. is to share with the Kettering Urban District Council Electricity Department a stand at this year's Northamptonshire County Agricultural Show.

A wireless and electrical exhibition is to be promoted at the Central Hall, Kettering, by the Kettering Radio and Physical Society immediately after this year's Radio Exhibition at Olympia. British manufacturers and local traders are to be invited to exhibit.

The Electrical Distribution of Yorkshire, Ltd., Leeds, is holding an electrical exhibition this week in the Victoria Hall, Queensbury.

The E.D.A. May Programme

The May programme of the British Electrical Development Association contains an illustration of one of a series of window displays which have been specially prepared for the E.D.A. water-heating campaign. The materials required are inexpensive and the display can be adapted to any electrical dealer's window. Examples of seasonal advertisements are included, and illustrations are given of two new posters (size 30 in. × 20 in.) advertising electric fires and washers. The Association is now producing two further double-crown posters dealing with electric cooking and water heating respectively. The price list of seasonal literature covers heating, water heating, refrigeration, and general subjects.

A 6-ft. synchronous clock has been installed by Smith's English Clocks, Ltd., on a L.M.S. Railway bridge at Cricklewood

Economic Conditions in Finland

A decidedly brighter trade outlook in Finland is reported in a recent publication of the Department of Overseas Trade relating to the economic situation in that country. After the new Government's renunciation at the end of last year of the inflationary policy, confidence seems to have returned, and many branches of industry show signs of revival. The most prominent feature of Finnish foreign commercial policy last year was the adjustment of trade relations with Great Britain, and a British shopping week is to be held early next Sep-

tember. Imports of electrical machinery in 1932 amounted to 837 tons, as compared with 1,438 tons in the preceding year, while insulated cable imports declined from 1,457 to 881 tons. There was practically no change in accumulator imports (329 tons against 333 tons), but imports of lamps increased from 71 to 79 tons.

Trade Announcements

The Belgrave Electric Co., Ltd., has been appointed sole southern distributors for the lighting fittings manufactured by Messrs. Hume Atkins & Co., Ltd., Letchworth, and has a complete range of their products on view at its showrooms at 24, Belgrave Road.

The telephone number of the Westinghouse Brake & Saxby Signal Co., Ltd., has been changed to Terminus 6432.

The Electrical Equipment & Carbon Co., Ltd., has been appointed sole selling agent for London and the South of England for the v.i.r., lead covered, and tough rubber covered cables and flexibles manufactured by the British Driver-Harris Co., Ltd. The company also represents Acelite, Ltd., Halesowen, for the sale of its electric fires in London, Middlesex, Essex, Leicestershire, Derbyshire, and Nottinghamshire.

United Engineers & Founders, Ltd., has recently opened an office at 9, Victoria St., Westminster, S.W.1, and represents the interests of four prominent South Wales engineering firms. Mr. Dennis Thomas, a director of one of the associated companies—Thomas & Clement, Ltd.—is in charge.

Electric Lamp Factors, Ltd., has recently opened a new branch at 3, Michaels Street, Southampton, under the joint management of Messrs. Wall & Attwooll, of Portsmouth.

Crompton-Kye Lamps Sales, Ltd., Bush House, W.C., has been formed for the purpose of marketing Crompton and Kye lamps. The directors are: Messrs. F. Parkinson (chairman), E. C. Holroyde, and T. H. Windibank.

The Curtis Manufacturing Co., Ltd., is moving its works and offices to its new factory at 26-28, Paddenswick Road, Hammersmith, W.6, on May 8th.

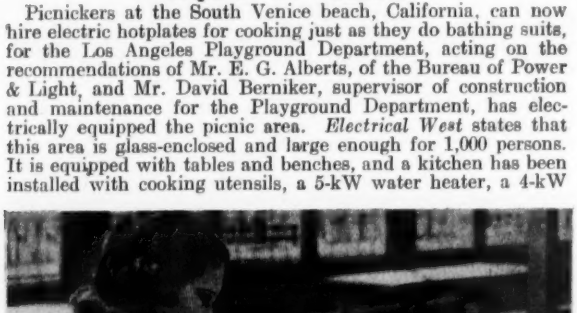
The Publicity Department of the Edison Swan Electric Co., Ltd., has been removed to 155, Charing Cross Road, W.C. (telephone: Gerrard 8660).

Domestic Electrification, Ltd., has removed to new offices at 85/86, New Bond Street, W.

Mr. J. E. Horsburgh, manufacturers' agent, has removed to 95, Belmont Row, Birmingham (telephone: Aston Cross 2400).

Hotplates for Picnickers

Picnickers at the South Venice beach, California, can now hire electric hotplates for cooking just as they do bathing suits, for the Los Angeles Playground Department, acting on the recommendations of Mr. E. G. Alberts, of the Bureau of Power & Light, and Mr. David Berniker, supervisor of construction and maintenance for the Playground Department, has electrically equipped the picnic area. *Electrical West* states that this area is glass-enclosed and large enough for 1,000 persons. It is equipped with tables and benches, and a kitchen has been installed with cooking utensils, a 5-kW water heater, a 4-kW



A picnicker making use of one of the automatic hotplates at the South Venice beach, California

broiler and four 3-kW hotplates. In addition, eight 2-kW hotplates have been placed outside, close to the picnic tables, making a total connected load of 37 kW. These hotplates were made in the Playground Department's shops with "Chromalox" units and installed by the Department's electricians. An automatic time switch and prepayment meter is mounted on each plate.

Recent Contracts

Messrs. C. A. Parsons & Co., Ltd., have received from Messrs. Martin & Co., India, an order for a 4,000-kW steam turbine, complete with alternator and condensing plant, for the United Provinces Electricity Supply Co., Lucknow. The unit will generate three-phase current at 3,300 V, and will work with steam at 250 lb. pressure, the condenser maintaining a vacuum of 27.4 in., with cooling water at 85 deg. F.

Siemens Electric Lamps & Supplies, Ltd., states that the new Merchant Taylors' School at Sandy Lodge, Moor Park, is lighted throughout with "Siemens" electric lamps. The electrical installation was carried out under the direction of Messrs. Albion T. Snell & Partners, consulting engineers, by Electrical Installations, Ltd.

"Tungstalite" Lamp Tests

We have just received a report of a test recently carried out by the Faraday House Testing Laboratories on twenty-five "Tungstalite" gasfilled lamps. Eleven were selected for a life test, which showed an average life of 1,000 hours, and ten were still intact at 1,045 hours when the test was discontinued. The average efficiency throughout life was 9.38 lumens per watt, the lumen maintenance being 93 per cent.

Social Event

Mr. T. A. G. Margary, Wolverhampton borough electrical engineer and manager, opened a new sports ground for members of the Corporation Electricity Department in the Penn district of Wolverhampton on April 29th. Mr. Margary, who is president of the Sports Club, pointed out that the grounds would be used mainly for the football and cricket teams. A number of sporting events were held to mark the opening.

Hoover's New Works

A large gathering assembled at Perivale on Tuesday to celebrate the official opening of the new head offices and up-to-date factory of Hoover, Ltd., by Lord Rochdale, Lord Lieutenant of Middlesex, who was given a military reception. After luncheon, at which the speakers were Lord Rochdale, Mr. C. B. Colston, chairman of the company, Mr. E. L. Colston, sales director, Miss Ellen Wilkinson, Col. the Master of Sempill, and Mr. H. Gordon Selfridge, a tour of the works was undertaken. The factory embodies the latest practice in modern industrial design and equipment. Its output of vacuum cleaners has already exceeded the initial total contemplated, and it affords employment for 600 (250 office workers) of the 3,000 men and women employed by the company in this country, of whom 1,500 are salesmen. The business of the company is said to be increasing at the rate of 20 per cent. per annum, and the export of cleaners made in this factory to Europe and the British Empire is being actively developed. The new works were described and illustrated in our issue of February 3rd (page 155).

The German Radio Industry

Arrangements are being made in the German radio industry for bringing about some system of concentration. According to provisional agreements which have been entered into between the manufacturers and merchants and retailers the number of merchants is to be reduced and they are to be bound by prices, while makers agree not to sell to any merchants other than those with whom these arrangements are being made.

A Cooker Price Correction

Last week an advertisement of the "Tricity No. 800" cooker appeared, in which the price was given as £18. The British Electric Transformer Co., Ltd., asks us to state that the figure should have been £13.

Economic Conditions in Hungary

In a Department of Overseas Trade report on economic conditions in Hungary between 1930 and 1932, the Commercial Secretary to H.M. Legation at Budapest remarks that the depression in trade and industry began to be felt in 1929 and has continued in an intensified form to the present day. The position now in Hungary is a difficult one, and the future is still uncertain. For the first nine months of 1932 imports of electrical machinery and apparatus totalled only 2,450,000 pengö, as compared with 6,237,000 pengö in the corresponding period of the preceding year, the United Kingdom's share falling from 298,000 to 243,000 pengö. During the same period exports of electrical machinery and apparatus showed a decline from 17,213,000 to 14,748,000 pengö. The United Kingdom imported Hungarian radio valves to the value of 243,000 pengö (against 3,132,000 pengö), and incandescent lamps to the value of 25,000 pengö (against 111,000 pengö).

Automobile Direction Signals

The Departmental Committee on Traffic Signs has reported to the Minister of Transport that it does not see any objection to mechanical or electrical direction indicators on motor vehicles, if drivers prefer them to the recognised hand signals. The Committee unanimously concluded that the fitting of direction indicators on motor vehicles should not be made compulsory, and further agreed that if signals of intention to turn right or left were made by mechanical means they should be given by an illuminated sign of amber colour of a minimum illuminated length of six inches. Flashing signs should not be used. The Minister of Transport has given notice that any regulations he may make following the committee's recommendations will apply only to vehicles registered for the first time on or after October 1st next.

For Sale

The West Midlands Joint Electricity Authority offers for disposal plant and equipment at the West Bromwich generating station. (See our classified advertisements.)

Prices of Materials

Messrs. F. Smith & Co. report, May 3rd: Electrolytic copper bars, £35 10s., £1 5s. inc.; electrolytic copper sheets,

no change; electrolytic copper wire rods, £45, 10s. inc.; electrolytic copper h.c. wire, 7¼d., ⅞d. inc.; silicium bronze wire, no change.

Messrs. Edward Till & Co. report, May 3rd: India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, May 3rd: No change in the prices of copper bars (best selected), sheet and rod and English pig lead.

New Catalogues and Lists

Porn & Dunwoody, Ltd., 72-78, Fleet Street, E.C.4.—A catalogue illustrating and describing the company's all-British lifts.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Leaflet W.6376, giving particulars of the new "Rhino" tough rubber sheathed trailing cable. Also publication No. F.6451, describing enamelled steel dispersive and industrial reflectors, and dustproof lighting units.

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.4.—A leaflet (No. H.C.872), dealing with "Ediswan" immersion heaters.

Electric Construction Co., Ltd., Bushbury Engineering Works, Wolverhampton.—A folder (No. B.1046) enclosing illustrations of plant recently supplied for various industrial purposes, film studios, &c.

Le Grand, Sutcliffe & Gell, Ltd., Southall, Middlesex.—An illustrated brochure (No. 54/1) relating to the company's recent activities in shaft sinking, boreholes, headings, reservoirs, pipe lines and pumping installations.

Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.—Catalogue sheets Nos. D117/8, D143/4, and E51/2, describing respectively duplex recorders, kVA recorders, and "multiversal" type current transformers.

Hailwood & Ackroyd, Ltd., Morley, Leeds.—Leaflets illustrating new "Hailware" panel fittings and decorated shades.

Eric J. Lever (Trix), Ltd., 8-9, Clerkenwell Green, E.C.1.—Leaflets dealing with power amplifier equipment.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—A folder (in Welsh) relating to the company's wiring system.

Baldwin Instrument Co., 91, Belle Grove, Welling, Kent.—Reprints of articles describing the "Logohm" resistance bridge and the "Mufer" capacity bridge.

Beeantee Illuminations, Ltd., 70, Banner Street, Bunhill Row, E.C.1.—A booklet giving details of new products with data respecting "Beeantee" strip lighting.

Thomas Broadbent & Sons, Ltd., Central Ironworks, Huddersfield.—List No. 25A describing a new type of automatic hydro-extractor.

Walker Fender Co., Ltd., Despatch Works, Sherborne Street, Ladywood, Birmingham.—A folder illustrating some of the latest types of "Walkerlite" metal floor and table lamps.

Attwoods (Factors), Ltd., Fryer Street and Long Street, Wolverhampton.—A general catalogue of electrical fittings and accessories.

Lancashire Dynamo & Crypto, Ltd., 94, Petty France, Westminster, S.W.1.—List No. K.3, relating to recent developments in Crypto valve rectifiers for cinema projector arcs.

W. T. French & Son, Mysto Works, Ladywood, Birmingham.—Catalogues Nos. 92 and 99, dealing respectively with "Mysto" aluminium ware and domestic electrical appliances generally.

Bankruptcy Proceedings

J. Stewart, radio dealer, 10, Murton Street, Murton Colliery, lately of Seaside Lane, Easington Colliery, Durham.—The first meeting of creditors was held on April 25th, at the Official Receiver's offices, 32, Frederick Street, Sunderland, when the statement of affairs showed gross liabilities of £1,207, and a deficiency of £1,061. The debtor attributed his position to ill-health, liabilities under hire-purchase agreements cancelled by customers, and rapid depreciation in the value of stock. The case, being a summary one, was left in the hands of the Official Receiver as trustee.

T. Hodgson, wireless dealer, &c., 66, Adelphi Street, Preston.—The public examination was held recently at the Sessions Hall, Preston, when the statement of affairs showed liabilities of £923, and a deficiency of £711. The position was attributed to "cotton trade depression in Preston and scarcity of spending money among the people, fall in prices of records, having to sell goods at under cost price, and insufficient turnover and profits to meet expenses." The debtor stated that there was a lot of under-cutting in the trade, and he thought there were far too many wireless dealers in the town. The examination was adjourned for closing.

J. Ainsworth, J. W. Baildon, and **G. A. Mawson** (trading in partnership as Radio Services and Repair Depôt), radio dealers, repairers and engineers, 30, Whetley Hill, and 217, Huddersfield Road, Low Moor, Bradford.—The public examination was held at the County Court, Manor Row, Bradford, recently. According to the joint statement of affairs lodged there was a deficiency of £920. Mawson's examination was concluded, while that of Ainsworth and Baildon was adjourned, with liberty to restore.

R. Pearson (R. Pearson & Sons), electrical accessories manufacturer, "Xtra Point" Electrical Works, Walshaw Road, Bury.—Trustee, Mr. A. T. Eaves, 47, Moseley Street, Manchester, released April 4th.

L. G. Cooper, electrical engineer, "Dunarden," Rossall Beach, Cleveleys, near Blackpool.—Receiving order made April 20th on debtor's own petition.

C. I. Bentley, (Traders' Electric Lighting Supply), electrical factor, 9, Fish Street, Hull.—Receiving order made April 22nd on debtor's own petition.

D. T. Donovan, electrical engineer, (London Electrical Co.), 119, St. Mary Street, Cardiff.—Discharge suspended for one month until May 5th.

S. L. Cox, electrical engineer, Holmes Yard, Shirland Road, Chesterfield.—Trustee, Mr. L. Barnes, 73, Saltergate, Chesterfield, released April 7th.

H. C. Mealing (Yorkshire & Lincolnshire Electric Development Co.), 73, Lawrence Street, York.—Last day for receiving proofs for dividend May 13th. Trustee, Mr. D. S. Mackay, The Red House, Duncombe Place, York, Official Receiver.

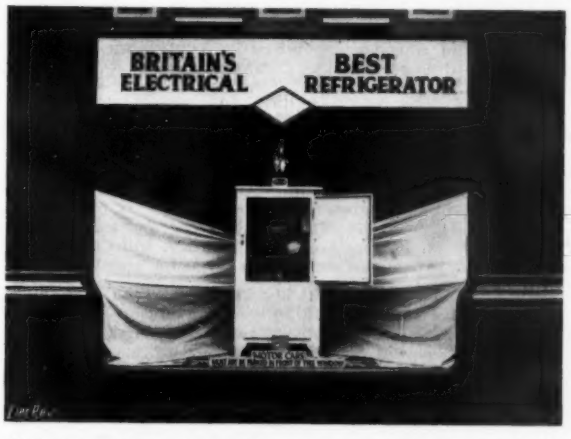
H. L. Kinvig, electrician, 167, Jeffcock Road, Wolverhampton.—Public examination, June 8th, at the County Court, Wolverhampton.

S. Gillitt (G.E.T. Electrical Supplies Co.), Lansdowne, Offerton Lane, Offerton, near Stockport.—Application for discharge to be heard May 16th at the Court House, Stockport.

H. A. Langlois (Electrical Installation Co.), electrical contractor, 2, Atlas Place, Cardiff.—Trustee, Mr. L. S. Findlay, 35, Windsor Place, Cardiff, appointed April 19th.

Company Liquidations

"Fay" Radio & Recorders, Ltd., 101, Oxford Street, W., and Halco House, Great Peter Street, Westminster.—Under this compulsory liquidation the statutory first meetings of the creditors and shareholders were held on April 25th at Carey Street. Mr. G. D. Pepys, Senior Official Receiver, reported that the company was formed in May, 1931, as "Fay" Home Recorders, Ltd., and in November, 1932, was converted into "Fay" Radio & Recorders, Ltd. It was formed to acquire for £10,000 in shares from Hugh Patrick Fay the benefit of an invention relating to improved means for making records on gramophones, and to carry on business as manufacturers of home recording machines and electrical amplifiers. The company manufactured a series of home recorders and accessories and the whole of the company's cash capital of £16,400 was absorbed in the development of the various models; the failure was attributed to the poor response by the public to a prospectus issued in December, 1932. The accounts filed under the liquidation showed liabilities of £5,628, against assets of £1,200, and a deficiency of £31,026 with regard to contributories, the issued capital amounting to £26,400. Mr. Chanhalls was elected liquidator.



With the Union Jack as a base and surmounted by a statuette of John Bull, this display of the "Leda" refrigerator is attracting much attention in the showrooms of the Manchester Electricity Department in St. Ann Street

Kenneth Brooks (Radio & Television), Ltd., Britannia Works, Great College Street, N.W.1.—The statutory meeting of creditors was held on May 2nd at the offices of Messrs. Philip Mordant, Jarvis & Co., Cannon Street, E.C., when it was stated that the shareholders had passed a resolution nominating Mr. Jarvis as liquidator. A statement of affairs was submitted which showed liabilities of £29,781, of which £10,090 was due to the bank; there was a cash loan of £4,650, and unsecured creditors' claims amounting to £15,041. With regard to the unsecured creditors for £15,000 odd, it was stated that of that amount only £246 was due to the trade, the remainder being due to the Zetavox Radio & Television, Ltd., and to directors of that concern. The assets totalled £1,796, leaving a deficiency of £27,985. Mr. Jarvis said that prior to the liquidation proceedings, the creditors had met and discussed the position privately, and the majority of the creditors had agreed to accept a composition of 3s. in the £, and that was the reason why the trade creditors to-day totalled only £246, representing only those creditors who would not agree to the scheme of arrangement. The company was incorporated in November, 1931, with a share capital of £20,000, and from that date to April 30th last there was a net loss on trading of £30,312. The matter remains in the hands of Mr. Jarvis as liquidator.

Central Wholesale Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. J. Baker, Eldon Street House, E.C.

Cecil Cooper & Co. (London), Ltd.—Winding up voluntarily. Liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Electrical Service & Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. T. J. Edmunds, c/o 35, George Street, Pontypool.

Scott Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. H. C. Goodyear, 87, Hervey Close, Church End, Finchley, N. Particulars of claims to the liquidator by June 30th.

Thorpe & Thorpe, Ltd.—Meetings May 29th at Balfour House, Finsbury Pavement, E.C., to receive an account of the winding up by the liquidator, Mr. W. A. J. Osborne.

Dissolutions of Partnership

Torquay & South Devon Electrical Co., electrical and wireless engineers, 17, Old Mill Road, Chelston, Torquay.—Winifred I. Kelly and C. H. Large have dissolved partnership. Mr. Large will attend to debts and carry on the business.

Birchall Wright & Co., electricians and radio engineers, 333, London Road, Stoke-on-Trent.—Messrs. J. H. Wright, D. R. Birchall and D. Birchall have dissolved partnership.

Electricity Supply

Lighting, Domestic, Power

Australia.—ELECTRICITY CHARGES IN VICTORIA.—A deputation from the Municipal Association of Victoria recently suggested to the Minister in Charge of Electrical Undertakings the appointment of an expert commission to investigate the conduct of the State electricity undertakings by the Electricity Commission. It was stated that municipalities and the public were not getting a "fair deal" from the Commission, and that the cost of electricity was out of proportion to the cost of production. Mr. Macfarlan, the Minister, said that any inquiry except by Royal Commission would be useless, and there would have to be strong suspicions of mismanagement, waste of money, and extortionate use of powers before the Ministry could consider appointing such a commission. He promised to discuss with the Commission a suggestion for a reduction of 25 per cent. in the existing service charges.

Barrow.—ELECTRICITY CHARGES AT GRANGE.—The Electricity Committee recommends that the Grange Urban District Council should be informed that, subject (a) to its making a further reduction of ¼d. per kWh for all electricity used by domestic consumers on the rateable value tariff in excess of 240 kWh per quarter, and (b) agreeing to supply electricity for heating at 1d. per kWh for the first 240 kWh per quarter, and ¾d. per kWh for all in excess of that quantity, the Corporation will agree to reduce the secondary charge for electricity supplied from 0.625d. to ½d. per kWh.

Birkenhead.—ASSISTED WIRING.—The Finance Committee is recommending to the Electricity Committee that future installations under the assisted wiring scheme shall be made only in those houses where tenants agree to use 120 kWh per annum, and that in cases where this consumption is not reached tenants shall be required to pay a penny for each kWh below the specified quantity.

Birmingham.—AN ENVIABLE POSITION.—The Electric Supply Committee reports that the record output of electricity in Birmingham last year will place the city at the head of municipal undertakings in the country in this respect. The sales of electrical energy for the financial year just ended amounted to 434¾ million kWh, which is an increase of nearly 46 million kWh (or nearly 12 per cent.) over the sales for the year 1931-32. Birmingham has hitherto ranked second to Manchester in the matter of output. Whilst satisfactory advances are shown with regard to domestic supplies, the bulk of the increase is due to several large industrial accounts opened during the year. During March a further 1,146 consumers were connected, making a total increase for the financial year of nearly 12,000. The number of consumers now being supplied is 130,716—nearly double the number four years ago.

Bradford.—REDUCED CHARGES.—The Electricity Department recommends reductions in charges for electricity for traction and street lighting purposes amounting to £8,276 a year.

Cardiff.—CONSUMERS' DISCOUNTS.—It is proposed to allow a discount of 10 per cent. on electricity accounts if paid within twenty-one days.

Cheltenham.—MAINS EXTENSIONS.—The Rural District Council has approved an application by the Town Council to extend the mains to Shurdington, Badgeworth, Bamfurlong, Golden Valley, and on to Haydon, subject to the Bamfurlong section being laid underground.

COOLING PONDS AS SWIMMING BATHS.—In connection with a proposal to convert electricity cooling ponds into a swimming bath, the Town Improvement Committee has asked the borough engineer to prepare an estimate of the cost of constructing an entirely new bath on another site, so that a comparison may be made.

Chigwell.—ELECTRICITY FOR CHIGWELL ROW.—The County of London Electric Supply Co., Ltd., has informed the Parish Council that work in connection with providing a supply of electricity for Chigwell Row is to be commenced forthwith.

China.—ELECTRICAL DEVELOPMENT.—Owing to the unsettled conditions, the total generating capacity in China has increased by only 6 per cent. within the last three years. There are now 665 power stations with an aggregate capacity of 893,645 kW, 146 of these stations being industrial plants which supply 37.5 per cent. of the total output. The average investment per kW is $600, and only about 2,000 kW is hydro-electric.

Chorley.—ELECTRICAL GENERATION AT SEWAGE WORKS.—The Sanitary Committee is considering the question of generating electricity at the Common Bank sewage works.

Cumberland.—EXTENSION SCHEMES.—The Mid-Cumberland Electricity Supply Co., Ltd., has informed the public bodies in its area that supplies of electricity will be made available by next September or October for Great Salkeld, Edenhall, Langwathby, Culgaith, Lazenby, Kirkoswald, and Melmerby. Penrith will be used as a base.

Douglas (I.O.M.).—CHANGE-OVER.—The change-over from d.c. to a.c. is to be carried out shortly in the area comprising the North and South Quays, Duke Street, Strand Street, Castle Street, Loch Promenade, Victoria Street, and Finch Road. Between 500 and 600 consumers are affected.

Eastbourne.—SUPPLIES AT POLEGATE.—The Electricity Committee is to provide electricity for an estate at Polegate, where 200 houses are to be erected.

Exeter.—LOANS SANCTIONED.—The Electricity Committee has obtained sanction to loans of £5,000 for sub-station equipment, and £10,000 for domestic apparatus for hire.

ASSISTED WIRING PROGRESS.—Over 2,500 houses have now been wired under the assisted scheme.

Glasgow.—CHEAPER ELECTRICITY.—The Electricity Committee recommends substantial reductions in charges to all classes of consumers. It is estimated that the annual loss to the Department's revenue will amount to £220,000, made up as follows: Domestic consumers, £36,000; business lighting and heating, £122,000; industrial power, £50,000; public lighting, £12,000. According to Mr. T. S. Park, convener of the Committee, despite the depression, the use of electricity by domestic and business consumers is increasing rapidly. In the industrial field, however, there has been a falling-off during the past two years, but the Committee is confident that the new industrial power rates will not only assist to revive industry, but will go a long way towards bringing new business to the city. Glasgow Corporation, Mr. Park says, can claim that the kVA rate for industrial energy is the cheapest in the country. The reductions during the past four years, and taking the present proposals into account, resulted in an annual benefit to consumers of £700,000. The new scale proposed for the two-rate residential tariff is: 40 kWh for the first apartment and 20 kWh for each additional apartment at 3½d. per kWh (a reduction of 1d.), and a secondary rate of ½d. per kWh. There is also a penny reduction in the commercial tariff for lighting, heating, and cooking (non-residential), lowering it to 3½d. per kWh, and a reduction of ½d. in the secondary rate, making this ¾d. For industrial power, at the ordinary rate, it is proposed to charge 1d. per kWh for any quantity up to 40,000 kWh, and thereafter ¾d. per kWh. The present rate for the same service is 1½d. up to 100,000 kWh.

PROGRESS DURING MARCH.—Under the Electricity Department's scheme 123 houses were wired in March, making the total to date 37,299; hired appliances now total 18,680.

ELECTRICAL INSTALLATION AT INSTITUTION.—The Public Assistance Committee has authorised the director to advertise for offers for electrical work at Lennox Castle Institution. The Committee has approved a report by the architect recommending the adoption of the panel system of heating.

MAINS EXTENSIONS.—Distributing mains are to be laid at a cost of £2,284.

Grays (Essex).—MAINS EXTENSIONS.—The Urban District Council is applying for sanction to a loan of £7,798 for mains extensions.

Hailsham.—ELECTRICITY FOR HOOE.—With reference to the proposed supply of electricity for Hooe, the Weald Electricity Supply Co., Ltd., has informed the Rural District Council that it is negotiating with the Bexhill-on-Sea Town Council for a bulk supply.

Ilford.—REVISED CHARGES.—The Town Council has revised the tariff for the domestic contract rate, which now has a primary charge of 10 per cent. per annum of the rateable value, or 8s. 6d. per quarter, whichever amount is greater, plus ¼d. per kWh. The hire charges for cookers and urns are reduced to 2s. 6d. per quarter; on washers there is a reduction of 1s., and on fires from 1s. to 1s. 6d. The decrease in revenue will be £850 a year.

India.—SUPPLY IN BOMBAY.—The Bombay Tramways and Electric Supply Co. has had under consideration for some time a proposal to erect its own plant, but negotiations with the Tata Hydro Electric Companies have resulted in the acceptance of a scheme under which Tata's will not charge more than the rate at which the Bombay Co. could generate in its own station. There is besides an additional protection of a maximum rate, this new charge being substantially below the figure now operative.

Leicester.—EXTENSION SCHEMES.—H.p. mains costing £20,000 are to be laid by the Electricity Committee to Aylestone and Evington, and new sub-stations are to be erected in Narborough Road and Chatham Street.

London.—STOKE NEWINGTON.—The Electricity Committee is to carry out free wiring installations at a cost of £466.

ST. MARYLEBONE.—The installation of electricity at the Town Hall, and at the proposed new baths and washhouses in Shouldham Street, is under consideration.

POPLAR.—The Electricity Committee recommends a reduction in the flat rate for power from 2½d. to 1½d. per kWh., representing a concession of £7,500 to consumers.

Sanction has been received to a loan of £13,000 for services, meters, and installations.

The terms have been approved for the supply of electricity to the works of Messrs. Pinchin, Johnson & Co., Ltd., and the London Graving Dock Co., Ltd.

DEPTFORD.—The Housing Committee has given permission to tenants on the Council housing estate at Brockley to have electric lighting installed under the London Electric Supply Corporation's assisted wiring scheme without any liability attaching to the Council.

HAMMERSMITH.—Additional supplies are to be given to Granville Mansions, Shepherd's Bush Green, and the E.N.V. Engineering Co. at costs of £150 and £350 respectively.

The Electricity Committee recommends that the tariff for

the supply of electricity to cinemas and garages shall be extended to apply to theatres.

A scheme of central lighting is proposed in Hammersmith Bridge Road.

Machynlleth.—REVISED CHARGES.—The following revised scale of charges is to be introduced:—Lighting, 8d. per kWh for the first 125 kWh per quarter, with a sliding scale to 4d.; power, 3d. per kWh for the first 50 kWh per quarter, and 2½d. beyond; for motor power for commercial and agricultural purposes, the charge between 8 a.m. and 6 p.m. in the summer and 8 a.m. to 4 p.m. in the winter will be 1½d. per kWh; meter rents, 10 A, 1s. 6d. per quarter; 20 A, 2s.; 30 A, 2s. 6d.; 40 A, 3s.; 50 A., 3s. 6d. There is to be a fixed charge for smallholders for domestic lighting, as follows:—Two lights, 12s. 6d. each per annum; third light, 10s. per annum; fourth light, 10s. per annum; auxiliary lights, 7s. 6d. per annum.

Maidstone.—SUPPLY TO EAST FARLEIGH.—The Town Council is to extend the mains to East Farleigh to supply the pumping station of the Maidstone Waterworks Co., and the village, at an estimated cost of £2,400.

Morecambe.—ILLUMINATION SCHEMES.—At a recent meeting of the Electricity Committee it was reported that the Illuminations Sub-committee had requested the Committee to consider the question of supplying energy for private illuminations free of charge during carnival week. The borough engineer reported upon the advisability of providing h.p. equipment at points on the promenade to be used in connection with illumination events, and stated that the proposed equipment opposite the old harbour buildings was essential for the anticipated development of the premises and the new Midland Hotel. The proposals were approved and the work is to be carried out at an estimated cost of £1,500.

Moretonhampstead.—DISTRIBUTION SCHEME APPROVED.—The Parish Council has approved plans prepared by the Torquay Electricity Department for a distribution scheme.

Paisley.—INSTALLATION CHARGES.—A committee of the Town Council is considering the charges made for installing electrical appliances. Up to the present this has been done on request, and an annual charge imposed to cover the outlay. It is understood that it is proposed to have a stipulated period over which these charges will be made, and that when they cease the installation will become the property of the tenant.

Port Dinorwic.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Electricity Distribution of North Wales & District, Ltd., to supply electricity in parts of the rural districts of Gwyrfai and Ogwen.

Preston.—LOAN.—The Electricity Committee is to make application for sanction to a loan of £27,500 for the erection of two chimney stacks and other works at the Ribble power station; this takes the place of a previous resolution to borrow £22,000 for such works. It is intended to build a mid-wall inside the stack, which will arrest any soot or dust.

Rugby.—WIRING INSTALLATIONS.—The Town Council has decided to apply for sanction to a loan of £900 for wiring Council houses at Croop Hill for electric lighting, and open tenders for the work are to be invited. The 100 houses, which are in the supply area of the Leicestershire & Warwickshire Electric Power Co., will all be wired, and the supply connected to those whose tenants desire a supply of electricity.

Russia.—NEW GENERATING PLANT.—The increase in the capacity of the electric power stations in Russia during the first quarter of the current year is estimated by "Glavenergo," the chief organisation of the power industry in the country, at 250,000 kW. The new plant includes the first 50,000-kW turbo-generator at the Nevdubstroy station, near Leningrad. Three more turbines of similar capacity will be installed at a later date, and, when fully completed, the output will double the present electric power supply of Leningrad; this station uses peat exclusively as fuel. Another important undertaking which is about to start operations is a central experimental station in Moscow, which will supply heat to a selected list of industrial enterprises in the city and power to the Moscow electrical system. Successful tests were conducted at the beginning of March on the first turbo-generator, which is of 50,000-kW capacity. The sixth 62,500-kW generator at the Dniepr hydro-electric station was successfully tested in February, and it is shortly to be put into operation.

Skipton.—A WARNING TO CONSUMERS.—A warning was given to electricity consumers at a recent meeting of the Urban District Council. Mr. M. H. Morris, chairman of the Electricity Committee, said that recently visits were paid to various consumers for the purposes of ascertaining the manner in which electricity was being used. It was found that a fair proportion of consumers were using electricity in an irregular way by taking power supplies for lighting purposes. There were between twenty and thirty offenders, including two contractors. In view of the fact that most of these were acting quite innocently, the Council had decided to issue a warning against future happenings of that description. If contractors offended again, the Committee would take proceedings against them and cut off their supplies.

South Africa.—THE LICHTENBURG SCHEME.—In his report on the new electricity scheme for Lichtenburg, Mr. A. E. Val Davies, consulting engineer, calculates the total capital cost as £22,247. He recommends the acceptance of the tender of Messrs. Reunert & Lenz, Ltd., Johannesburg, of £8,465 for the complete power plant, and of their tender of £4,471 for the mains for the distribution system. The Town Council considered the proposals, and some members thought they should aim at a cheaper scheme. It was decided to ask Mr. Val Davies to have an interview with the Council to discuss the matter.

JOHANNESBURG TO HAVE RESERVE SUPPLY.—The Johannesburg City Council has arranged with the Victoria Falls & Transvaal Power Co. for a reserve supply of electricity. The scheme will cost about £60,000, spread over ten years, in addition to the price of the energy consumed.

South Shields.—COMMISSIONERS AND RELIEF OF RATES.—The decision of the Town Council to transfer a sum from the reserves of the Electricity Department to relieve the rates has been brought to the notice of the Electricity Commissioners, who have written for an explanation. The sum taken by the Council was £22,000, of which £4,000 was the estimated profit for the year. This enabled the Council to reduce an increase of 2s. in the pound on the rates to 1s. The town clerk has advised the Council that, while it has a legal right to take the year's profit for the relief of rates, the reserve funds can be used only as the statutes permit. It is understood that the Commissioners do not forbid the Council to take the money, but raise the question of legality of its action. A deputation is to meet the Commissioners in London.

Stoke-on-Trent.—EXTENSIONS.—The Electricity Committee has arranged to provide electricity to the Greasleyside Farm Estate of the Sutton Trust at Abbey Hulton, at a cost of £1,750.

LOANS SANCTIONED.—Sanction has been received to loans of £1,000 for electric motors for hire-purchase, and £1,350 for mains extensions in Wolstanton.

Usk.—PROSPECTS OF SUPPLY.—The Urban District Council has received a letter from the Electricity Commissioners stating that negotiations are proceeding with regard to the transfer of supply powers, and that there is every hope electricity will be available at Usk very shortly.

York.—COUNCIL HOUSE INSTALLATIONS.—The Housing Committee has agreed that, before tenders are invited for the erection of the next Council houses, it should consider the advisability of omitting electrical work from the specification, and asking the Electricity Department to submit a quotation.

MAINS AND SERVICES.—Sanction has been obtained to the borrowing of £30,000 for mains and services.

Traction

Austria.—FEDERAL RAILWAY ELECTRIFICATION.—The electrification programme of the Austrian Federal Railways has been extended since the details appeared in our issue of April 8th. In addition to the Vienna-Salzburg and Vienna-Graz main lines, the electrification scheme now embraces the conversion of the Vienna-Strass Sommerein, Tauern, and Bregenz-St. Margrethen lines. Although only nine miles long, the last-named section is very important, as it provides the connecting link between the electrified systems of Germany, Switzerland, and Austria. The programme covers 470 miles of line.

Birmingham.—TRAM SERVICE TO REMAIN.—The Corporation has decided not to proceed with the proposals to substitute buses for trams between Dudley and Birmingham, *via* Tividale. This step has been taken as the result of strong opposition from the Rowley Regis Urban District Council, through whose area the service passes, on the ground that it would lead to an increase of fares.

Bolton.—THE TRANSPORT QUESTION.—The Industrial Development Committee has expressed the opinion that the problem of substituting buses for trams will soon have to be faced.

Durham.—TRAFFIC SIGNALS.—The City Council is asking the County Council to make a grant towards the installation of traffic signals at certain junctions.

Glasgow.—LOAN.—At the end of the present financial year the unexhausted borrowing powers of the Transport Department will amount to £124,940, from which the current year's capital expenditure, amounting to about £70,000, has to be deducted. The balance will be insufficient to meet the estimated capital expenditure of £94,000 upon the electrification of the Subway, and the Committee has agreed that, in the next Provisional Order to be promoted by the Corporation, a clause be inserted for additional borrowing powers to the extent of £100,000 for transport purposes.

Leadgate (Co. Durham).—TRAFFIC SIGNALS.—The Urban District Council is pressing the County Council to erect traffic signals at cross roads.

London.—TRAFFIC CONTROL.—The automatic traffic control system in Oxford Street is shortly to be extended from Tottenham Court Road to Kingsway.

Middlesbrough.—THE TRANSPORT PROBLEM.—The transport services of the town were again discussed at a recent meeting of the General Purposes Committee. A resolution was passed to appoint a sub-committee to define the position of transport undertakings for the town and district. Councillor Meehan urged the desirability of one body controlling the transport service of both Stockton and Middlesbrough. Councillor J. Hamill contradicted a statement that negotiations had been broken off with the United Automobile Services,

Ltd., for the merger with the Corporation's undertaking. He said that the merger might be impossible on the terms offered, but the negotiations had not been abandoned. There was another point that could be discussed—that of co-ordinating the service by permitting the lifting of the ban of protection upon the United Co.'s vehicles for a monetary return.

TROLLEY-BUS INVESTIGATIONS.—Following its recent decision to abandon the Linthorpe tram service, the Town Council has appointed a sub-committee to inquire into the question of inaugurating a trolley-bus service.

South Africa.—RAILWAY ELECTRIFICATION.—For several years the Government's approval has been sought to the electrification of the Harrismith-Ladysmith railway line, and the *South African Electrical Review and Engineer* now states that the efforts made are at last within measurable distance of success. It is definitely known that £98,000 has been placed on the estimates for the approval of Parliament, and it is believed that the guarantee that there will be a saving of £40,000 a year, representing the difference between steam and electrical working, will make approval certain. The £98,000 represents the total cost of electrification, and a large portion of this amount is to be spent on two sub-stations, one between Ladysmith and Van Reenen, and the other near Harrismith. In the last few months extra staff has been engaged to prepare diagrams and plans, and official visits have been paid to the sixty miles of line which it is proposed to convert. The section is one of the most difficult in the Union for the working of steam trains, and the advantages of electricity have long been realised. Power will be supplied by Colenso station at very little extra cost. The next step in the electrification of the Natal railways will be extension of the system to Durban, when doubling of the main line has been completed. It is understood that if the line is electrified through to Harrismith, that town will be able to dispense with its local electric plant, and take about 1,000,000 kWh a year from Colenso.

Communications

Argentina.—NEW BROADCASTER.—Test transmissions from the new "Radio Excelsior" broadcasting station at Buenos Aires have been received by Marconi engineers at Chelmsford, Essex. The wavelength of the station is 361 metres and the power 20 kW (unmodulated aerial carrier energy). The test programme was clearly heard, particularly before sunrise, a frame aerial being used when atmospherics became troublesome and an ordinary "open" aerial at other times. The transmitter was designed and constructed at the Marconi works, Chelmsford, to replace an earlier installation of comparatively low power. Its modern features include low-power modulation, crystal frequency control, and careful provision for a frequency response substantially flat between 30 and 10,000 cycles. "Radio Excelsior" has one of the highest broadcasting aerials in the world, the horizontal member being suspended between two towers 700 ft. high.

China.—NEW WIRELESS SERVICE.—The Government has authorised the establishment of a Customs radio service as a means of rapid communication to assist in the prevention of coastal smuggling.

Denmark.—RADIO LICENCE FEES.—According to a decision of the Minister of Public Works, listeners in Denmark are to pay a licence fee of 10 kr. (about 9s.) for the financial year from April 1st, 1933, to March 31st, 1934. Licences taken

Sir B. N. Mitra (High Commissioner for India), Sir Kingsley Wood (Postmaster-General), and Sir Samuel Hoare (Secretary of State for India) speaking from the General Post Office, London, to India, on the occasion of the inauguration of the new radio-telephone service on Monday

out during the period from December 15th, 1933, to March 31st, 1934, will be reduced to 5 kr. for the remainder of the financial year. The fee will also be payable for receiving sets which are on trial or loan, says *World Radio*, and listeners who avoid payment are liable to a fine of at least 40 kr., and, in certain cases, to have their receiving sets confiscated.

Great Britain.—RADIO RELAY EXCHANGES.—The Kettering Urban Council has permitted Mr. Paul Taylor, a radio dealer, to inaugurate a relay service in the town. "Radiomains" will employ six main transmission lines, one sub-amplifier, and radiate dual programmes. The service, which opens in two weeks' time, is to be given free to all blind people, and an offer of free service to those schools that require it is receiving the attention of the local education authorities.

Alternative programmes will be available in about ten weeks' time for subscribers to the Wellingborough branch of Broadcast Listeners' Service, Ltd., which at present radiates only a single programme. Part of the duplicate wiring has already been installed.

The Bournemouth Corporation Roads Committee is considering several applications for permission to operate a wireless receiving station for distributing programmes to certain parts of the borough.

Cookham Rural Council has decided to oppose the erection of poles and wires in part of its area by the British Wire Broadcasting Service, Maidenhead. The Berkshire County Council, as highway authority, has raised no objection.

An electrically operated indicator now used by the British Broadcasting Corporation to give instructions to broadcasters

Guatemala.—TELEPHONE SERVICE.—Another Central American country has been put into telephone connection with North America with the inauguration this week of a service to Guatemala City. Guatemala is reached by a short-wave radio-telephone circuit between stations of the Tropical Radio Telegraph Co. at Guatemala City and stations of the A. T. & T. Co. at Miami, linked with the Bell System network. This is the third Central American country to which a telephone service has been established.—*Reuter's Trade Service* (New York).

India.—RADIO-TELEPHONE SERVICE.—A radio-telephone service between Great Britain and Bombay and Poona was opened on May 1st. The inaugural conversations were broadcast by the B.B.C.

Irish Free State.—RADIO STATIONS.—The 2.5-kW Dublin broadcasting station is to be reopened. It will use a wavelength between 200 and 230 metres, since its old wavelength of 413 metres is now used by the new 60-kW Athlone transmitter. The Cork relay station now works on 224.4 metres. There are about 3,000 crystal-set listeners around Cork and Dublin.

Manchester.—AIR PORT RADIO.—The Marconi station erected for the Air Ministry at the Manchester Air Port came into regular operation on May 1st. This is the first fully equipped wireless station to be erected in a municipal air port in Great Britain, and will provide ground-and-air communication by telephone or telegraph, meteorological broadcasts, wireless direction finding, and inter-aerodrome communication. It also has sufficient power and range to keep in touch with aircraft making the Irish Sea crossing to Belfast or Dublin. The equipment installed comprises a Marconi ground transmitter of approximately 3-kW power input and a direction finding receiver. The arrangement of the receiving station and direction finder is similar to that at the London Air Port, Croydon. The transmitting station is about one mile from the Air Port at Barton Moss and is remotely operated from the wireless control room on the aerodrome. This is to obviate any possible danger to arriving and departing aircraft on account of the two 100-ft. masts and the aerials of the transmitting station.

Rumania.—NEW TELEPHONE BUILDING.—Bucharest's tallest building, a ten-storey structure forming the headquarters of the Rumanian Telephone Co., was officially opened on April 24th in the presence of King Carol and ministers of his Cabinet. The company took over the Government telephone service two years ago, and great progress has been made in modernising and expanding the system. Work on the automatisation of the service is well in hand, and, with the introduction of additional circuits and improved operating methods, the internal and international long-distance services have considerably improved. Before the transfer international telephone communication was limited to the neighbouring countries of Hungary, Yugoslavia, and Bulgaria. To-day Rumania can telephone to practically all European countries, as well as to the U.S.A., Canada, Mexico, Cuba, Australia, South Africa, Egypt, Java, and Sumatra, and to ships at sea. The Rumanian Telephone Co. purchases large quantities of British material, such as telephone cable, carrier and repeater equipment, and telephone subscribers' sets.

Sweden.—WIRELESS LICENCES.—The number of broadcast wireless receiving licences in force at the end of March was 632,840, representing 102.7 per thousand of the population, says a *Reuter's Trade Service* message from Stockholm.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentine.—BUENOS AIRES.—June 19th. Ministry of Public Works. Hydro-electric plant, including turbo-generators, Diesel-electric generators, transformer, switchboards, accessories, spares and tools. (A.X. 11767.)*

Australia.—SYDNEY.—May 29th. Municipal Council. 50-kV pin and strain type insulators. Constructional Engineer's Office, Electricity Department, St. Andrew's Place, Sydney (deposit £1).
June 6th. Current differential transformers. Constructional Engineer's Office, Electricity Department (preliminary deposit £30).
MELBOURNE.—May 30th. Posts and Telegraphs Department. Rubber-insulated telephone wire (A.X. 11778)* and cordless telephone switchboards (A.X. 11779)*.

Bath.—May 31st. Electricity Department. Meters and h.p. and l.p. cables. (See this issue.)

Biggleswade.—May 8th. Rural District Council. Electric wiring at forty houses. R.D.C. surveyor, 192, Drove Road.

Cardiff.—May 16th. Electricity Department. E.h.p. and l.p. paper-insulated cables. (April 21st.)

Cheadle and Gatley.—May 12th. Electricity Department. 200-kVA oil-cooled static transformers. (April 28th.)

China.—Government Purchasing Commission. 2,000-kVA synchronous condenser, with exciter, &c. (April 28th.)

Cleethorpes.—May 8th. Electricity Department. L.p. cables. (April 28th.)
May 22nd. Sub-station equipment. (April 28th.)

Dewsbury.—May 10th. Wiring installation at Dewsbury Technical College. Mr. R. W. Grubb, borough electrical engineer, Electricity Department, Bradford Road, Dewsbury (deposit £1).

Dover.—May 12th. Electricity Department. Meters (April 28th.)

Dumfries.—May 8th. County Council. Transformers. (April 21st.)

Edinburgh.—May 8th. Corporation. X-ray apparatus and auxiliary equipment at the Western General Hospital. Medical officer, Johnston Terrace.

Egypt—CAIRO.—June 27th. Ministry of the Interior. Electrical distribution network to supply Samallout and Maassaret Samallout. (A.X. 11780).*
June 15th. Ministry of Education. Diesel generating set. (A.X. 11783.)*

Epsom.—May 15th. Electricity Department. 1,000-kW rotary-convertor equipment. (See this issue.)

Grimsby.—Electricity Department. Second-hand d.c. shunt-wound motors and starters. (See this issue.)

Irlam.—May 15th. Urban District Council. Street lighting poles. (April 28th.)

Kirkcudbright.—May 17th. County Council. 11-kV overhead and underground distribution lines. (April 21st.)

London.—HOLBORN.—May 16th. Borough Council. Automatic traffic control signals. (April 14th.)
OFFICE OF WORKS.—May 16th. Lamps. (See this issue.)

Manchester.—May 12th. Electricity Department. De-superheater plant for Stuart Street power station. (April 28th.)
May 15th. Highways Department. Vehicle-actuated traffic-control installations at Oldham Road and Varley Street, and at Oldham Road and Dean Lane, Newton Heath. Surveyor, Highways, Department, Town Hall.

Menston (near Leeds).—May 15th. Installation of electric lighting at Mental Hospital. Mr. E. H. Burton, architect, Board offices, Wakefield.

New Zealand.—WELLINGTON.—June 6th. Post and Telegraph Department. 100 miles of v.i.r. insulated wire. (A.X. 11770.)*
DUNEDIN.—May 24th. Corporation Tramways. 330 yd. of feeder cable. (A.X. 11769.)*

Rosslynlee.—May 20th. Midlothian and Peebles Asylum Board. Rewiring of Asylum and installation of new ventilating fans. (See this issue.)

Salford.—May 10th. Electricity Department. 33-kV feeders for l.p. pilot cable. (April 28th.)

Shipley.—May 16th. Electricity Department. Paper insulated cables. (See this issue.)

South Africa.—PRETORIA.—May 19th. Government Supplies Board. Telephone terminal blocks and outdoor distribution boxes (A.X. 11775)*, and pole bases, lightning rods, screw rings, tape, &c. (G.X. 12516.)*
June 2nd. 6,000 sac-type elements for Leclanché cells (A.X. 11786)* and fifteen motor-driven magneto generators (A.X. 11785.)*
JOHANNESBURG.—May 20th. City Council. Sixty miles of twin-, three- and four-core 660- and 6,600-V cable. (A.X. 11784.)*

Southern Rhodesia.—SALISBURY.—June 6th. Municipal Council. Turbo-alternators, switchgear, cable, and transformers. (A.X. 11771.)*

West Riding.—May 9th. Education Committee. Installation of electric lighting at new schools at North Elmsall and Hoyland. Education officer, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barking.—Electricity Committee. Recommended. Switch.—A. Reyrolle & Co., Ltd. Cable (£714).—Metropolitan Electric Cable Co., Ltd.

Birkenhead.—Electricity Committee. Accepted. One 1,000-kVA transformer (£330).—Fuller Electrical & Manufacturing Co., Ltd. Switchgear.—Metropolitan-Vickers Electrical Co., Ltd. (£261); Erskine Heap & Co., Ltd. (£286).

Eastbourne.—Electricity Committee. Recommended. 200-kVA transformer (£161).—British Electric Transformer Co., Ltd.

Essex.—Public Assistance Committee. Accepted. Installation of electric lighting at Chelmsford casual wards (£165).—Electric Installation & Equipment Co.

Glasgow.—Corporation Housing Committee. Accepted. Electrical installation at various housing schemes.—A. A. Moore (£1,161); R. J. Sinclair (Glasgow), Ltd. (£834); Dick-Cleland, Bennett & Co., Ltd. (£781).
Cleansing Committee. Accepted. Eight electrically operated indicating steam flow meters (£457).—Electroflo Meters Co., Ltd.
Education Committee. Accepted. Electric clocks (£81).—Edward & Sons, Ltd. Electrical work at High School of Glasgow extension (£975).—Harland & Wolff, Ltd.

London.—POPLAR.—Electricity Committee. Recommended. Switchgear (£3,368).—Metropolitan-Vickers Electrical Co., Ltd. Repairing high-pressure rotor and stator and reblading turbo-alternator (£4,199).—Fraser & Chalmers Engineering Works.

Middlesex.—County Council. Accepted. Installation of new main switchboard at North Middlesex County Hospital (£728).—Kartret Switchgear Co., Ltd.

Mynyddislwyn.—Urban District Council. Accepted. Laying mains, &c., in connection with the Oakdale scheme (£5,300).—J. L. Eve Construction Co.

Norfolk.—County Council. Public Assistance Committee. Accepted. Electric lighting installation at Greseenhall institution (£203).—P. E. E. Hampton.

Warrington.—Electricity Committee. Accepted. Electric hot-water circulator for new showrooms.—General Electric Co., Ltd. Sub-station switchgear.—Ferguson, Pailin, Ltd.

Forthcoming Events

Royal Institution.—Friday, May 5th. Institution, London. 8.30 p.m. Conversazione.
Association of Supervising Electrical Engineers.—Saturday, May 6th. Visit to the works of Messrs. Gillett & Johnston, Ltd., Croydon.
Illuminating Engineering Society.—Tuesday, May 9th. Institution of Mechanical Engineers, London. 7 p.m. Annual meeting. Discussion on "Principles of Directive Street Lighting." Opened by the president.
Institution of Civil Engineers.—Tuesday, May 9th. Institution, London. 6 p.m. Annual meeting.
Television Society.—Wednesday, May 10th. University College, W.C. 7 p.m. "The Design of Television Transmission Equipment." Mr. J. C. Wilson.
Institution of Electrical Engineers.—Thursday, May 11th. Institution, London. 6 p.m. Annual meeting. (*Meter and Instrument Section*).—Saturday, May 6th. Visit to Hampton Court and the National Physical Laboratory. (*North Midland Centre*).—Tuesday, May 9th. University, Leeds. 5 p.m. "A Model of the Electric Field." Sir J. J. Thomson. (*Scottish Centre*).—Friday, May 12th. Foresters' Hall, Dundee. 7.30 p.m. Faraday Lecture. "Lightning—And how the Engineer Deals with its Effects." Prof. J. T. MacGregor-Morris. Saturday, May 13th. Excursion from Dundee to Pitlochry.

Laying a 60,000-V Submarine Cable

A NEW three-phase cable, capable of transmitting 20,000 kVA at 60,000 V, has been laid across the Alsener Sund (Denmark), about 1 km. (0.62 mile) north of the Sonderborg bridge, to replace two old 15,000-V cables in the supply of the island of Alsen. The new cable was ordered from the A.E.G. by the Apenrade electricity works, and operates in connection with a 60,000-V overhead line. The overall diameter is 126 mm. (4.96 in.), and the weight about 40 kg. per metre (26.9 lb. per ft.). On leaving the armouring machine at the makers' works, says *Elektrotechnische Zeitschrift*, the cable was carried by a roller conveyor on to a drum which was then mounted with its axis parallel to the keel of the motor ship used for laying the cable. The Alsener Sund is about 1,640 ft. in width, with a maximum depth of 52½ ft. The water is shallow near the shores, hence piers at about water level were built on piles out to the navigable channel, so that the cable ends could be landed safely and easily.

The cable-laying vessel, with its engines running to oppose the current, was hauled across the Sund broadside on, the cable being paid out to starboard. The cable end was received on a lighter between the motor ship and the pier, landed by means of rollers on the latter, and bedded in troughs at low water.

Notes

The Clinker Memorial Premium

The late Mr. Reginald Charles Clinker was well known to engineers for his pioneer work in various fields of research. After his death in 1931, a Clinker Memorial Fund was established as a tribute to his memory for the award of a premium annually to the author or authors of the best original paper on any subject coming within the scope of the activities of the Rugby Engineering Society and not previously published elsewhere. The award, which is of the value of about £4 10s., is not restricted to members of the Society. Offers of suitable papers for the 1933-34 award will be welcomed by the hon. corresponding secretary, Rugby Engineering Society, c/o the B.T.-H. Co., Ltd., Rugby.

The I.E.E. Annual Report

Copies of the annual report of the Council of the Institution of Electrical Engineers for session 1932-33, and of the accounts for the year ended December 31st, 1932, can now be obtained by members of the Institution on application to the secretary. The annual general meeting is to be held on May 11th.

Fatality

Alexander McHaffie (18) of Airdrie, was accidently killed on April 28th while at work with an Airdrie firm of boilermakers at United Collieries' Breich Colliery. He was carrying an electric lamp and took hold of an uninsulated part of the wire, receiving a fatal electric shock.

Appointments Vacant

Junior engineer in Consumers' Engineer's Department for Portsmouth Electricity Department.

Electro-mechanical engineer assistant for University College, Southampton.

Assistant engineer at Knowle Mental Hospital, Fareham.

(See our classified advertisements.)

Mining Electrical Engineers

The annual Convention of the Association of Mining Electrical Engineers will be held in Blackpool from June 26th to 30th. The members will be received at the Hydro Hotel on the Monday, and the provisional programme for the remainder of the Convention is as follows:—

Tuesday, June 27th.—Visit to the works of British Insulated Cables, Ltd., Prescot. Visit to an ocean liner, Liverpool Cathedral, or the works of the Automatic Electric Co., Ltd.

Wednesday, June 28th.—Excursion to the Lake District, or to the Isle of Man *via* Fleetwood. Civic reception and dance at the Winter Gardens.

Thursday, June 29th.—Visit to the Bradford works of the English Electric Co., Ltd.

Friday, June 30th.—Council and general meeting. Annual dinner and dance.

Measuring the Moistness of Paper

The "Siccometer" developed by Siemens & Halske, Berlin, is intended primarily for the continuous measurement of the moisture content of paper passing through a paper-making machine, thus making possible technical and economic advantages in manufacture. The principle employed is that of using the variations in the dielectric constant of the paper, depending on the moisture content of the material, to alter the capacity in one arm of a capacity-bridge circuit. The method has the important advantage that there is no lag in the indications. The construction of the measuring condenser or

The "Siccometer"

"Siccometer" cell, shown diagrammatically at *a* in the accompanying illustration from *Elektrotechnische Zeitschrift*, is such that its capacity is affected by the moisture content of the paper rather than by the thickness of the latter.

One electrode of the condenser consists of a plate with 132 holes, into which penetrate the broadened heads of as many rods or pins. The displacement current, passing between the edges of the pins and the edges of the holes, traverses the fibres in the plane of the paper. The bridge circuit *b* with variable condenser *c* is arranged to eliminate the effect of the leakage resulting from the direct contact between the paper and the condenser. Besides the measuring voltage derived from the rectifier circuit *f*, an auxiliary voltage of appropriate phase is applied to the measuring bridge. The bridge balance is thus made to depend only on the capacity components of the currents flowing. In the diagram, *d* represents an amplifier, *e* the indicating or recording instrument, and *g* an 800-cycle generator. The bridge is balanced by means of the condenser *c*, while the "Siccometer" is clear of the paper, and the instrument is then brought into its working position.

The British Association Meeting

The preliminary programme has been issued by the British Association for the Advancement of Science for its meeting at Leicester from September 6th to 13th. This year's president is Sir Frederick Gowland Hopkins, Pres. R.S.; the president of the Engineering Section is Mr. R. W. Allen, C.B.E. The programme contains a good deal of information likely to be of service to those who propose to attend the meeting. The inaugural general meeting is to take place on September 6th, when the president will deliver an address dealing with the chemical aspects of life. The meetings of the Engineering Section are to be held in Lancaster Hall. The programme of excursions includes visits to the Leicester Corporation electricity works and to the Rugby works of the British Thomson-Houston Co., Ltd.

The E.A.W.

At the conclusion of the three-day course arranged by E.D.A., E.L.M.A., and the E.A.W., which again proved most successful, a dinner was held at Pinoli's Restaurant when members of the Training and Diploma Committee were the guests of demonstrators holding the E.A.W. Grade I Diploma.

Lady Moir was in the chair, and Mr. R. S. Downe, vice-chairman of the Sub-Committee, emphasised the special value of the diploma to the employer choosing applicants for posts. Miss A. A. Stemp responded, and Mr. A. C. Cramb, Director of E.D.A., paid a tribute to the work of women demonstrators. Miss Haslett also spoke.

The annual meeting of the North Wales Branch of the Electrical Association for Women was held recently at Chester, Councillor Mrs. Breeze presiding. Miss C. Haslett, director, referred to the work and progress of the Association, and in the absence of Mrs. Ferranti read a paper prepared by her dealing with her all-electric farm.

The Transport Congress

The annual congress of the Tramways, Light Railways and Transport Association will be held at Leeds on June 8th and 9th.

The Erren Hydrogen Engine

The Erren motor is an internal-combustion engine of German design that operates on hydrogen or a mixture of hydrogen and other fuel such as crude oil. For the production of the hydrogen, a pressure electrolyser has been developed which separates, cleans, purifies, and compresses the hydrogen and oxygen. The fuel consumption of a 300-h.p., 500-r.p.m., four-stroke, six-cylinder engine, with a compression ratio of 4½ to 1, is stated to be 0.6 cu. m. per h.p.-hr., giving a thermal efficiency of about 45 per cent., taking the lower heat value of the hydrogen as 2,360 calories per cu. m. It is also claimed that the thermal efficiency can be increased to 57 per cent. by the adoption of a compression ratio of 8 to 1. The exhaust consists of superheated water vapour and nitrogen (85 per cent.) at 400 to 500 deg. C., and is therefore clean. The initial costs of installation in Rm. per kW, as given for various energy accumulators, are: Erren, 166; Diesel, 225; hydraulic h.p. accumulator, 230; electric batteries, 500.

Existing internal-combustion engines can usually be converted to the Erren system, and the German State Railways have adopted a 100-h.p. engine for traction purposes. Other claims for this engine are a saving in fuel of 80 per cent., as compared with petrol, when working on hydrogen and air, or of 55 per cent. when working on hydrogen and crude oil, and a saving of 50 to 70 per cent. in lubricating oil.

Electric Locomotive Life

After nearly fourteen years of service hauling passenger trains on the Coast Division of the Chicago, Milwaukee, St. Paul and Pacific Railroad, locomotive 10250, shipped from the Erie (Pa.) works of the General Electric Company in 1919, has been designated for exhibition during the Century of Progress Exposition at Chicago. The locomotive, together with several others constructed in Erie at the same time, has been in active service drawing heavy passenger trains over the grade section of this railroad through the Cascade Mountains. Many thousands of people have travelled in these electrically hauled trains during the past fourteen years. The locomotive has been operated in service at speeds in excess of ninety miles an hour. Over the heavy grades in the Cascade Mountains it has pulled from thirteen to fifteen heavy steel Pullman cars without assistance, both up and down the grades. A feature of this electrified railroad is the use of regenerative electric braking to ease the strain on the usual air brakes. Records of the railroad company show nearly 1,000,000 miles credited to each locomotive during their period of service, or an average of about 75,000 miles each per year.

Makers' Names Wanted

M.L.W. lampholders.

SAFEGUARD electric washer.

SANDWELL electric iron.

TRIX public address system.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

At the conclusion of the annual meeting of the Royal Institution on May 1st a portrait of **Sir William Bragg,** the director, by Mr. William Nicholson, was presented to the Institution by the hon. secretary, Major C. E. S. Phillips, on behalf of a group of friends. Major Phillips expressed the respect and admiration which the members of the Institution felt for the scientific achievements of Sir William and their appreciation of the manner in which he had upheld the great traditions of the Institution. Lord Eustace Percy, the president, in accepting the gift on behalf of the Institution, also paid a tribute to Sir William, who said that he was proud and grateful that his portrait should be given with such expressions of goodwill.

Mr. J. A. Collier has resigned from the position of general manager of the traction section of the San Paulo Light & Power Co. Mr. Collier is now in this country.

Mr. Roland Dunkerley

Mr. Roland Dunkerley, comptroller of the United Steel Companies, Ltd., has succeeded **Sir Reginald Townsend,** K.C.B., C.B.E., Director General of Government Factories, as president of the Institute of Cost and Works Accountants. Mr. Dunkerley has been associated with the Institute since its inception, having been responsible for the formation of the Manchester, Sheffield, Leeds, Liverpool and North Midlands branches. He commenced his career as a junior in the cost department of Hans Renold, Ltd., subsequently becoming cost accountant. Later he was associated with the Metropolitan-Vickers organisation as works accountant, and ultimately in addition was appointed comptroller of Metro-Vick Supplies. He joined the United Steel Companies, Ltd., in 1928. He has served on several national committees, including the National Cost Committee which formulated standard costing for the electrical industry, and on national cost committees for the iron and steel industry.

Mr. L. Lord has been elected president of the Illuminating Engineering Society of Australia (Sydney Division) for the current year.

M. Robert Gillet de Valbreuze, the president of the Société Française des Electriciens, has recently been appointed a Commander of the French Legion of Honour.

Mr. W. T. Taylor, M.I.E.E., who is well known to our readers for his articles on electricity distribution matters, was to leave for Brazil yesterday (Thursday) by the s.s. *Flandria.* He expects to be in South America conducting investigation work for some considerable time.

Sir Holberry Mensforth, K.C.B., C.B.E., and **Lt.-Col. A. P. Pyne** have been elected to the Technical Committee of Lloyd's Register of Shipping, which is being strengthened in view of the increasing importance of electrical installations, both as regards the propulsion of vessels and the wiring on board ship. Col. Pyne is chairman of the Ship Electrical Equipment Committee of the Institution of Electrical Engineers.

Mr. G. O. Watson

Mr. G. O. Watson has been appointed senior electrical engineer on the chief engineer surveyor's staff of Lloyd's Register of Shipping. Mr. Watson, who was formerly deputy chief control gear designer to the British Thomson-Houston Co., Ltd., has had considerable experience in connection with electrical gear for electrically propelled vessels.

Mr. E. W. Meare, late of the Wandsworth Electrical Manufacturing Co., Ltd., has joined the London sales staff of Messrs. J. H. Tucker & Co., Ltd., as representative for their South London area. Mr. Meare has a wide experience in the electrical industry, having been for many years with Messrs. Siemens Bros. & Co., Ltd.

Mr. Makovski, of Tamplin & Makovski, has been re-elected president of the Reigate and Redhill Chamber of Commerce.

Mr. R. H. Tree, the chief clerk of the Institution of Electrical Engineers, will retire on pension on June 30 next, when he will have completed forty-six years in the service of the Institution. Altogether Mr. Tree has been connected with the Institution for about fifty-three years, for prior to his joining the Institution staff in 1887 he was for some years in the employ of Sir Francis Bolton, who was one of the two co-founders of the Institution and in whose office its Council and other meetings were frequently held.

Mr. R. H. Tree

Mr. L. F. Bickell, city electrical engineer of Port Elizabeth, has been elected president of the Association of Municipal Electrical Engineers of South Africa for the ensuing year.

Mr. L. M. Freeman, of the staff of the Wakefield Corporation Electricity Department, who was recently married to Miss R. Johnson, has been presented by his colleagues with an oak clock with Westminster chimes.

Mr. H. C. Hazel

Mr. H. C. Hazel has been appointed inspector by the National Register of Installation Contractors, and has already taken up his duties. Mr. Hazel, who was the proprietor of the firm of Lindsay & Co., electrical contractors, Liverpool, has been very prominent in the affairs of the Electrical Contractors' Association, and was president of that body in 1930-31. He is a member of the Institution of Electrical Engineers. We reproduce a photograph of Mr. Hazel which we took at the 1931 Conference of the E.C.A.

Mr. H. J. Dewar and **Mr. J. L. Hill,** M.I.E.E., have been appointed members of the South African Electricity Control Board for a further period of one year.

Mr. H. Alcock, export manager of Messrs. W. T. Glover & Co., Ltd., has arrived in this country after a visit to South Africa.

The ELECTRICAL REVIEW congratulates **Mrs. Marjorie M. Hutchinson,** wife of Mr. A. J. Hutchinson, chief electrical engineer and general manager at Farnworth electricity works, upon winning the E.A.W. President's cup this year. Mrs. Hutchinson is the chairman of the Farnworth Group of the Electrical Association for Women, and the cup is awarded to the member who introduces the largest number of new members in the country in any one year. Though the Farnworth undertaking (population 30,000) is a small one, the E.A.W. branch is very much alive, and for some months past has regularly had 85 per cent. of its membership present at lectures and other functions. We understand that the presentation of the cup takes place to-day (Friday) at the Association's conference at Birmingham.

Mrs. M. M. Hutchinson

Mr. F. G. Stevens has been appointed by Birkenhead Corporation Electricity Committee as installation inspector.

Mr. A. A. Blackburn, tramway manager to the Huddersfield Corporation, who has retired on superannuation, has been presented with a five-valve wireless set by the chief officials.

Mr. T. H. Lee, of the staff of the power station at Crewe Railway Works, has retired after fifty years' service, and has been presented by his colleagues with a clock.

Mr. H. Mozley, formerly transport manager to Burnley Corporation for many years, and Mrs. Mozley recently celebrated their golden wedding.

Dr. M. L. Kahn

Dr. M. L. Kahn has been appointed by the General Electric Co., Ltd., to the position of chief engineer of Engineering Department at Witton Works, thereby taking over the duties hitherto performed by the late Mr. R. Orsettich. Dr. Kahn is well known throughout the electrical industry, having been chief of the Design Department at Witton for the past twenty years. He was awarded his doctorate in 1902 for original research upon the characteristics of the contact resistance of carbon brushes. This work came before the notice of Prof. E. Arnold who was at that time engaged with J. L. La Cour upon the preparation of a series of text books. Dr. Kahn was asked to assist in their preparation, and the seven volumes covering the design and construction of electrical machinery, which subsequently were issued, are to-day regarded as classics. After some years with Prof. Arnold, Dr. Kahn joined the Brush Electrical Engineering Co. in 1904 as chief designer of electrical machinery, transformers and switchgear, his responsibility being extended later to include construction and testing. He filled this position until invited to join the G.E.C. in 1913. During his service with the latter company he has designed some of the most important electrical machines built in this country.

Mr. J. Price Walters, B.Sc.Tech., who for the last five years has been with the Carrier Engineering Co., Ltd., has been appointed sales and technical representative by Messrs. Judd, Budd, Ltd., Oxford House, John Street, E.C.

Mr. Robert Laird, has been awarded the first prize for his paper on oscillographs by the West of Scotland Branch of the Association of Mining Electrical Engineers.

Mr. E. F. Bacon, commercial manager in the Electricity Department of the Colchester Corporation, has been appointed electrical engineer to the Holmfirth Urban District Council. He succeeds Mr. H. C. Spence, who is leaving Holmfirth to take up the position of deputy distribution engineer to the Croydon Corporation.

Mr. J. C. Denison-Pender has been elected a director and chairman of the board of the Marconi International Marine Communication Co., Ltd., and **Mr. F. S. Hayburn** has been appointed managing director of the company. Both of these offices were held by the late Mr. F. G. Kellaway.

Mr. E. L. Damant, superintendent of the power station at Congella, Durban, of the South African Electricity Supply Commission, is shortly leaving for Europe. He will attend the World Power Conference at Stockholm and the International Conference on Large High Tension Electric Systems at Paris as the official delegate of the South African Institute of Electrical Engineers.

Mr. J. McCaul, who has been for thirty-five years in the service of the Glasgow Corporation Transport Department, has been appointed chief permanent way engineer at a salary of £600. The Transport Committee has also approved of the following promotions:—Mr. J. Anderson to be chief assistant permanent way engineer, at a salary of £400; and Messrs. F. Smith and W. Russell, to be assistant civil engineers, first grade, at salaries of £315.

Obituary

Mr. F. P. Driver.—The death occurred on April 25th of Mr. F. P. Driver, works manager of the Osram-G.E.C. Lamp Works, Hammersmith. Mr. Driver joined the General Electric Co.'s Lamp Works (then Robertson Electric Lamps, Ltd.) in 1896, since when his services with the Company have covered an unbroken period of thirty-seven years. His career, beginning very soon after the company's first venture into electric lamp manufacture, linked up the successive stages of the industry from a time when the factory-made lamps were little more than copies of the early products of the pioneer laboratory workers down to the present days of mass production. He saw the development, in which he himself took an active part, of one type of lamp after another and of innumerable successive types of machinery. In earlier life he was an enthusiastic cyclist and pedestrian, while his later hobbies were principally golf and motoring. He was a freemason of very many years' standing, and at the time of his death was Worshipful Master of the Molesey Lodge. He was also a member of the Hammersmith Rotary Club. Mr. Driver married, in 1921, Mildred, daughter of Mr. Christopher Wilson, a director of the G.E.C.

Monsieur G. Viard.—The death recently occurred in Paris, at the early age of forty-five years, of Monsieur Georges Viard, the managing director of the Société des Lignes Télégraphiques et Téléphoniques, and a leading French authority on telegraphy and telephony.

Mr. W. J. Verrier.—The death occurred on April 17 of Mr. William James Verrier, works superintendent at the Englab Electric Co.'s works, Rugby. He entered the service of Willans & Robinson, Ltd., at Rugby in 1897, and remained, with an interval of two years, up to the time of his death. After being machine shop superintendent, he was appointed works superintendent about six years ago.

Sir Arthur Whitelegge.—The death occurred on April 25th at Westminster Hospital, at the age of 80, of Sir Arthur Whitelegge, who was for twenty-one years Chief Inspector of Factories and Workshops. He was appointed to the position in 1896 and retired in 1917. He was created a C.B. in 1902, and a K.C.B. in 1911.

Will.—Mr. W. J. Potter, a director of W. T. Henley's Telegraph Works Co., Ltd., left £25,752 (net personalty £25,142).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Foulkes Gornall & Co., Ltd.—Private company. Registered April 26th. Capital, £3,000 in £1 shares. Objects: To acquire (1) the business of a dealer in radio apparatus carried on by W. J. Jones at Welsh Bridge and Castleforegate, Shrewsbury, as "Foulkes Radio," and (2) the business of electrical engineers carried on by H. J. Gornall and J. W. Hodgkinson at 4, Chester Street, Shrewsbury, as "Gornall & Co." The first directors are: William J. Jones, 30, Mardol, Shrewsbury (chairman); John W. Hodgkinson, 4, Chester Street, Shrewsbury, electrical engineer, and two others. Solicitors: Pinsent & Co., 6, Bennetts Hill, Birmingham.

Crompton-Kye Lamp Sales, Ltd.—Private company. Registered May 1st. Capital £10,000 in £1 shares. Objects:- To acquire from Crompton Parkinson, Ltd., and Kye Electrical, Ltd., the lamp sales departments of those companies and certain assets in connection therewith, and to carry on the business of manufacturers, merchants, and retailers of electric lamps, electrical fittings and goods, and wireless apparatus, etc. The subscribers are: G. H. Rimell, 35, Dowanhill Road, Catford, S.E.6, and D. A. James, 59, Salisbury Road, West Ealing. Solicitors: Warren, Murton & Co., 45, Bloomsbury Square, W.C.1.

Great West Electrical Co., Ltd.—Private company. Registered May 1st. Capital £1,000 in 750 7½ per cent. participating preference shares of £1 each and 2,500 ordinary shares of 2s. each. Objects: To carry on the business of electrical engineers, contractors, armature winders, electrical wholesalers and agents, etc. The first directors are: H. V. Jackson, 22, Stanlake Road, Shepherd's Bush, W., Mrs. D. Jackson, 7, Barrack Road, Hounslow, and L. W. Harris, 8, Upper Swan Street, Southsea. Registered office: Argyle House, Euston Road, King's Cross, N.W.1.

Aurora Lights, Ltd.—Private company. Registered May 1st. Capital £1,500 in £1 shares. Objects: To acquire the business of manufacturers and distributors of the "Salopian" portable searchlights formerly carried on by R. S. Richards and F. Hamilton as the "Salopian Portable Searchlight Co." at 72, Guildhall Buildings, Navigation Street, Birmingham, and to carry on the business of electricians, mechanical engineers and manufacturers, etc. The directors are: E. W. Dawkins, 3, New Street, Birmingham, R. S. Richards, 982, Alum Rock Road, Birmingham, and F. Hamilton, jnr., 109, Lakey Lane, Hall Green, Birmingham. Registered office: 70, Guildhall Buildings, Navigation Street, Birmingham.

Power Management, Ltd.—Private company. Registered April 29th. Capital £5,000 in £1 shares. Objects: To carry on the business of mechanical and electrical engineers, electricians, financial advisers, agents, manufacturers of and contractors for the supply, erection, installation, operation or maintenance of plant, apparatus, machinery, buildings, etc. The first directors are: W. H. Botsford, 15, Moorgate, E.C.2; B. D. Fox and C. R. St. John, addresses not stated.

Harry's Wireless Service, Ltd.—Private company. Registered April 28th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of, agents for, and dealers in wireless sets, components and apparatus, electrical fittings, &c. The permanent directors are: R. Jackson, 18, Linden Avenue, Blackburn; and H. Wearden, 8, Howard Street, Rishton, Lancs. Solicitor: W. Hill, 31, Victoria Street, Blackburn.

Returns of Electrical Companies

Walsall Instruments, Ltd.—The nominal capital has been increased by the addition of £1,500 in £1 ordinary shares beyond the registered capital of £1,000.

Wilton Electricity Supply Co., Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £5,000.

Penrith Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £20,000 in £1 ordinary shares beyond the registered capital of £30,000.

Mid-Cumberland Electricity Co., Ltd.—The nominal capital has been increased by the addition of £90,000 in £1 ordinary shares beyond the registered capital of £10,000.

McLeod & McLeod, Ltd.—The nominal capital has been increased by the addition of £4,400 in £1 ordinary shares beyond the registered capital of £100.

Premier Electric Heaters, Ltd.—The nominal capital has been increased by the addition of £25,000 in £1 ordinary shares beyond the registered capital of £25,000.

Harvey-Thompson Accumulator Service, Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £2,000. The additional capital is divided into 2,000 6 per cent. cumulative preference shares of £1 each.

Electrical Power Engineering Co. (B'ham), Ltd.—Capital, £5,000 in £1 shares. Return dated October 20th (filed December 3rd), 1932. 2,695 shares taken up. £1,350 paid. £1,345 considered as paid. Mortgages and charges, nil.

Durrington Electric Light Co., Ltd.—Capital, £3,500 in £1 shares. Return dated April 5th, 1932 (filed February 24th, 1933). 3,340 shares taken up. £3,340 paid. Mortgages and charges, nil.

Giffens, Ltd.—Capital, £5,000 in £1 shares. Return dated December 23rd, 1932 (filed March 7th, 1933). All shares taken up. £2 paid. £4,998 considered as paid. Mortgages and charges, nil.

White, Jacoby & Co., Ltd.—Capital, £7,500 in £1 shares. Return dated January 12th, 1933. 5,794 shares taken up. £3,437 paid. £2,357 considered as paid. Mortgages and charges, £1,400.

Bell Electric Lamp Co., Ltd.—Capital, £500 in £1 shares. Return dated October 6th, 1932 (filed March 8th, 1933). All shares taken up. £100 considered as paid. Mortgages and charges, nil.

Barbados Electric Supply Corporation, Ltd.—Satisfaction to the extent of £22,000 (£3,000 not having been issued) on March 31st, 1933, of debentures authorised June 27th, 1922, and registered, July 3rd, 1922, securing £25,000.

City Notes

The Electric Supply Corporation, Ltd., held its annual meeting on April 28th, Mr. J. G. B. Stone (chairman) presiding. In presenting the report and accounts (ELEC. REV., April 28th, page 617), the chairman said that Chelmsford had increased its lamp connections by the equivalent of 60,484 in 33-W lamps, an increase of 47 per cent. during the year. The rapid expansion of the Chelmsford undertaking had been due to the introduction of the bulk supply and the completion of the change of system, which had enabled them to go ahead with extensions and to reduce charges. The other undertakings owned by the Corporation itself showed a normal increase in lamps connected, capital expenditure, and revenue, with the exception of the Dumbarton undertaking, which had suffered severely from the state of the shipbuilding industry. The entire closure of one large business reduced the lamp connections, and the revenue had fallen from £27,172 in 1931 to £24,871 in 1932. In order to meet as far as possible the difficulties of the situation they had reduced their power charges considerably. They hoped to have a supply of electricity in bulk at Totnes within the next few months, and they were endeavouring to come to terms with the Totnes Town Council regarding the conversion of the system of supply from d.c. to a.c., so that they might give the town a better and cheaper supply of electricity. The subsidiary companies had increased their lamp connections by 153,158, an increase of 62 per cent. on the whole, and this high figure was very largely due to the extension of the mains of the Sussex companies into new areas, and could be compared with the proportional increase of connections to the Corporation's own undertakings which amounted to about 15 per cent. The number of consumers connected to the mains of all the undertakings showed an increase of 29 per cent., and the sales of electricity an increase of 11 per cent. These increases had been obtained in spite of the disposal of the Hitchin undertaking and the reduction in the figures from Dumbarton.

The British Power & Light Corporation (1929), Ltd., reports that the gross revenue of its subsidiary companies was £429,678 for 1932, as compared with £373,420 in the preceding year. After deducting expenses and transferring £68,469 to reserve for depreciation and renewals, there remains a balance of £189,157 (£181,384). Interest, dividends, &c., require £187,018, leaving a balance of undivided profits of £2,139. The total undivided profits carried forward by the subsidiary companies amount to £51,524. The revenue received by the Corporation for the year ended March 31st from dividends and interest paid and payable by its subsidiary companies together with other interest and sundry receipts amounted to £89,718 (against £84,488), and the net revenue was £67,433 (£53,868), to which is added £55,316 brought in, making £122,749. The directors have applied £31,274 in writing off the expenses of increase of capital, and recommend an ordinary dividend of 3 per cent., less tax (same), leaving £33,628 to be carried forward. The sales of electricity by all the subsidiaries showed increases during the year, and the sales of energy for the first quarter of the current year show progress. Meeting: May 9th.

The Ever Ready Trust Co., Ltd., held an extraordinary meeting on May 1st, at which resolutions were adopted for the return to the shareholders of 10s. on every issued £1 ordinary share and £50 on every £100 deferred share, the consolidation of the reduced shares into their original denominations, and the restoration of the authorised capital to its present amount. Mr. Magnus Goodfellow (chairman) said that the recent offer for sale of 400,000 Lissen preference shares was heavily oversubscribed. The board was satisfied that the investment of £400,000 at this time, spread over a number of investments, would be made at a low rate of income, and with considerable risk of ultimate depreciation in capital value. It had therefore decided upon the return of capital to the shareholders.

The Ever Ready Co. (Great Britain), Ltd., has declared a final ordinary dividend of 25 per cent., making 35 per cent. for the year. This is at the same rate as for 1931 but on a larger capital. A preliminary statement shows a net profit of £343,375, as against £332,485. The amount placed to reserve and carried forward totals £771,594 (£694,120).

The Telephone Manufacturing Co., Ltd., reports a net profit for 1932 of £19,113, as compared with £18,451 in 1931. It is proposed to pay an initial dividend of 2½ per cent., to place £20,000 to general reserve, and to carry forward £14,684. The report states that although the turnover expanded, prices at which orders were secured were even lower than in 1931. Every endeavour is being made to reduce costs. Extensions to the factory are in progress. Meeting: May 8th.

The Oriental Telephone & Electric Co., Ltd., reports that the net revenue for 1932, after charging depreciation and renewals, is £97,498, against £96,110 for 1931. Adding £41,236 brought in, and deducting interim dividends, there is a balance of £109,318. It is proposed to pay a final ordinary dividend of 8 per cent., making 12 per cent. for the year, to place £10,000 to general reserve, and to carry forward £47,094. The subsidiary and associated companies maintained the dividends paid for 1931. Meeting: May 9th.

Cables & Wireless, Ltd., reports that the profit for 1932, with the carry forward from the previous year, is sufficient to enable the directors to recommend the payment of a final dividend for the year 1931 of 2¾ per cent., less tax, on the preference stock. Meeting: May 24th.

The Electricity Distribution of North Wales & District, Ltd., reports a profit of £18,834 for 1932 (against £17,641 for the preceding year). The preference dividend is paid, £1,500 is placed to income tax reserve, and £12,349 is carried forward (against £7,015). Meeting: May 8th.

The North Wales Power Co., Ltd., reports a profit for 1932 of £31,635 (against £34,861 in 1931). It is proposed to pay a dividend of 3½ per cent. (against 4 per cent.), to place £2,750 to income tax reserve, and to carry forward £47,447 (against £44,812 brought in). Meeting: May 8th.

The Globe Telegraph & Trust Co., Ltd., has recommended a final dividend for the year to May 31st of 2s. per share on the ordinary shares, making 2½ per cent. net. No ordinary dividend was paid in the previous year.

The Craigpark Electric Cable Co., Ltd., has announced a final ordinary dividend of 2 per cent., less tax, making 6 per cent. for the year (against 10 per cent.).

The Shanghai Electric Construction Co. has declared a final dividend of 7 per cent., free of tax, making 11 per cent. for the year (against 12½ per cent. for 1931).

S. Smith & Sons (Motor Accessories), Ltd., have announced an interim dividend of 5 per cent. (actual) on the 7 per cent. preferred ordinary shares. The interim distribution in the preceding year was postponed, but the full dividend was paid for the year.

The City of Buenos Ayres Tramway (1904), Ltd., has announced a quarterly dividend of 1s. 3d. per share, less tax.

Stocks and Shares

TUESDAY EVENING.

NO sooner was the Budget discussion out of the way than the Stock Exchange and the investor found a new development of interest arising in the United States. This was the passing through the Senate of the Farm Relief Bill, with the addition of an amendment that gave President Roosevelt power to pursue his policy of inflation. Immediately, the Wall Street Stock Exchange went wildly bullish. Commodities rose alongside with stocks and shares. Silver and base metal prices were favourably affected. The dawn of a new era of prosperity was declared to be at hand, if it had not already arrived. London took the news more soberly, of course, than New York did, but the probable effect of the inflation policy is actively discussed in its relation to British Government and gilt-edged securities, as well as to that of gold and gold-mining shares. The enthusiasm of New York cooled down after twenty-four hours' consideration, and prices went back. The events served to stir up business, and bring a good deal of extra animation, for the time being, into the Stock Exchange.

Stock on Offer

Two thousand pounds Hendon Electric 5 per cent. debenture stock can be obtained at 105; interest is due on the first of January and July. The yield at this price is 4¼ per cent. on the money, and to meet the £12,500 required for the annual interest service, the company showed a profit, in its last year's accounts, of £81,000. Of Northampton Electric 5 per cent. debenture there is on offer £5,000 at 108, yielding £4 12s. 6d. per cent., and with January and July interest payments. About £10,000 South Wales Electric Power 5 per cent. debenture is offered at 106, giving £4 14s. 3d. per cent.

return, and amply covered by earnings. The stock is, moreover, irredeemable. Interest falls due at the end of June and December. In such cases as those of the Hendon and Northampton debenture issues, where the stocks can be drawn or paid off, the investor should make himself fully acquainted with the terms of redemption. This is all the more necessary at the present time, when not a day passes without its contribution to the number of companies that are paying off one issue, generally of debenture character, and replacing it with a similar security which carries a lower rate of interest.

Home Electricity Supply

No movements of any importance amongst electricity descriptions can be traced to the new American policy. Prices of Home electricity supply shares are as steady as ever; nor is there any real reason why they should be otherwise. If anything, the tendency is better. For example, the prices of Clyde Valley, County of London, Midland Counties and Yorkshire Electrics are slightly harder than the official quotations show. Metropolitans advanced to 51s. 3d. Newcastle and District ordinary have firmed up to 32s. 9d., Chiswick ordinary to 48s. North Metropolitan new shares are 17s. premium, the old shares, ex rights, being 56s. 6d. Llanelly new shares keep about 3d. premium. British Power & Light ordinary at 16s. 9d. and the preference at 25s. 9d., have not been affected by the issue of the report. The ordinary dividend is repeated at 3 per cent. Hendon Electrics are a little easier at 2$\frac{7}{8}$, Isle of Thanet slightly better at 22s. 6d. Urban ordinary have drooped to 37s. 6d.

Railway Stocks

With a rise of 3 points, District 3½ per cent. assented first preference stock has advanced to 82½. This issue is guaranteed by the Underground Electric Railways Company of London, whose shares have at length risen to their par price of 20s. The District Railway's 4½ per cent. first preference stock, the dividend on which is contingent on the dividends of each half-year, is quoted at 104. The ordinary stocks of the Metropolitan and of the District are both a point higher at 73½ and 66½ respectively.

Accompanying these improvements, London & Suburban Traction preference are 6d. higher at 16s. 6d., and the company's 4½ per cent. debenture stock is up to 112½. The ordinary shares are 2s. 3d. London United Tramways preference have hardened to 4s.

Brazil and Argentina

In the group of foreign stocks, Brazilian Tractions are moving erratically, and in accordance with New York advices. Sao Paulo Tramway Light & Power 5 per cent. debenture stock is dull at 70. Interest has been duly met, so far, at due date: the price of the stock hints at a fear of the company finding difficulty in maintenance of the half-yearly payment during these days of foreign exchange troubles.

Notwithstanding previous statements to the contrary, a trade agreement has been reached between this country and the Argentine Republic. Argentine bonds and shares are disposed, accordingly, to be better. The two classes of preference shares in the Anglo-Argentine Tramways have attracted speculation, but very few holders would care to sell at the current price, which is 1s. 9d. As a melancholy monument to dead hopes, mention may be made of La Plata Electric Tramways ordinary shares, because the £1 fully paid shares are quoted 0 to 1s.; the last recorded bargain in them was at one penny per share, two years ago.

Cables and Wireless

On Tuesday in this week, Cables & Wireless declared a six months' dividend of 2¾ per cent., payable at the end of May, and leaving one year's dividend in arrears. This had been so generally expected that it caused scarcely a ripple of excitement in the market for the stocks. The preference stock rose 2 to 83½; the "A" ordinary at 27½ has gained the fraction. Given reasonable business activity, the combine should now be able to catch up by quicker steps the twelve months' arrears of dividend outstanding. If the stock were in receipt of its proper rate, the price would be standing, of course, considerably nearer par than it does now, and, as a speculative investment Cables & Wireless preference must be allowed to offer temptation. Telephone Rentals shares are easier at 5s. 9d. Telephone Manufacturing shares are dull at 3s. 6d. in spite of a satisfactory report from the company. On the other hand, International Automatic Telephones, which recently went ex dividend, have risen to 38s. 9d. The Oriental Telephone figures are considered good; the price is firm at 3.

Manufacturing and Equipment

The Johnson & Phillips meeting to be held on Thursday in this week is awaited with a good deal of interest, because the Chairman is expected to review the position for electrical work as a whole. The price of the shares remains at 18s. 3d. Ever Ready ordinary at 28s. are unaffected by the repetition of the 35 per cent. dividend. The shares are, of course, of the nominal value of 5s. each. The accounts show a continuance of the unbroken progress to which shareholders of the company have become accustomed. General Electric ordinary at 20s. 9d. are 9s. higher. Henleys at 6$\frac{1}{8}$ have gone back $\frac{1}{8}$. Brush ordinary fell 5 points to 40, business being done at 38 and lower. Babcock & Wilcox further gave way to 32s. upon consideration of the dividend reduction.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Approx. Dividend. 1931.	1932.	Price, May 2.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	74/6	+½	4 0 4
Brompton Ordinary	1	8½	7	33/–	—	4 4 10
Central Electricity 4½% Deb.	Stock	4½	4½	108	—	4 3 4
Charing Cross Ordinary	1	8½	7	33/6	—	4 3 7
Chelsea	1	8½	7	32/6	—	4 6 2
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	35/–	—	4 0 0
County of London	1	10½	10½	53/9	—	3 18 8
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	45/9	—	3 18 7
Elec. Supply Corporation	1	11	11	66/3	—	3 6 8
Kensington Ordinary	1	8	7	33/–	—	4 4 10
Lancs Light and Power	1	7	7	32/6	—	4 6 2
London & Home Counties 4½% Deb.	Stock	4½	4½	108	—	4 3 4
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	51/3	+¼	3 18 2
Midland Counties	1	7	7	35/–	—	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 6
North Eastern Electric Ordinary	1	6	6	30/–	—	4 0 0
Do. 7% Pref.	1	7	7	33/–	—	4 4 10
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	30/-xd.	—	4 0 0
St. James' and Pall Mall	1	8	7	32/6	—	4 6 2
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	7	33/-xd.	—	4 4 10
Urban Ordinary	1	7	7	37/6	—½	3 14 8
Westminster Ordinary	1	8½	7	32/6	—	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 2
Yorkshire Elec.	1	8	8	43/3	—	3 14 3

Home Rails.

Central London Ord. Assented	Stock	4	4	85½	—	4 13 7
Metropolitan	,,	2½	1½	73½	+1	2 4 2
Do. District	,,	4½	3	66½	+1	4 10 3
Underground Electric	1	7	4½	20/–	+6d.	4 10 0

Telegraph and Telephones.

		1930	1931			
American Tel. & Tel.	$100	9	9	127½	+5	7 1 6
Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
Do. Def.	,,	1½	1½	24	—	6 2 5
Cables & Wireless 5½% Pref.	,,	5½	2¾	83½	+2	3 5 10
Do. A 7½% Ord.	,,	—	Nil	27½	+½	—
Do. B Ord.	,,	—	Nil	10½	—	—
Globe Tel. and T. Ord.	10	8½	Nil	11	—	—
Do. do. Pref.	10	6	6	11¾	—	5 2 2
Great Northern Tel.	10	20	20	28	—	7 2 10
Marconi-Marine	1	15	10	28/9	—	5 4 4
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0

Home and Foreign Trams, Etc.

Anglo-Arg. Trams First Pref.	5	—	—	1/9	—	—
Do. do. 2nd Pref.	5	—	—	1/9	—	—
Do. do. 5% Deb.	Stock	—	—	5	—	—
British Electric Traction Def. Ord.	,,	5	5	255	—	—
Do. do. Pref. Ord.	,,	8	8	133	–1	6 0 4
Brazil Traction	100	—	—	11½	+½	—
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	16/6	+6d.	—
London United Tram Deb.	Stock	4	4	75½	—	5 6 0
Mexico Trams, 5% Bonds	—	5	5	26½	–4	18 17 0
Mexican Light Common	100	Nil	Nil	9½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	64½	—	7 15 0
Victoria Falls Ord.	1	15	15	4½	—	3 12 10
Yorkshire (West Riding)	1	Nil	Nil	6/–	—	—

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	4	15/9	—	5 1 7
Do. Pref.	1	8	8	30/–	—	5 6 8
Babcock & Wilcox	1	14	14	32/–	—	5 12 6
British Aluminium Ord.	1	10	5	25/–	—	4 0 0
British Insulated Ord.	1	15	15	68/9	—	4 7 3
Brush Ord.	Stock	5	Nil	40	—	—
Callender's	1	15	15	2½	—	5 2 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/–	30	24	21/6	—	5 2 4
Do. 8% Pref.	1	8	8	32/–	—	5 0 0
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	11/3	—	—
Enfield Cable Ord.	1	25	25	4½	—	5 11 1
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	11/3	—	—
Ever Ready	5/–	35	35	28/–	—	6 5 0
Ferranti Pref.	1	7	7	23/6	—	5 19 2
G.E.C. Pref.	1	6½	6½	29/9	—	4 7 5
Do. Ord.	1	10	8	40 9	+9d.	3 18 5
Henley's	1	30	30	6½	—⅛	4 17 10
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	5	18/3	—	5 9 7
Siemens Ord.	1	7½	7½	26/3	—	5 14 3
Telegraph Construction	£1	Nil	Nil	18/3	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

24637. "Electrical screening devices such as are used in wireless sets. C. H. Stave. September 2nd, 1931. (Cognate application 32247/31.) (390500.)

24681. "Protective means against excess current in arrangements for interchanging power between alternating and continuous current systems employing metal-vapour valves." Akt.-Ges. Brown, Boveri, et Cie. September 2nd, 1930 (390527.)

27451. "Electric control systems." British Thomson-Houston Co., Ltd. October 2nd, 1930. (390501.)

28413. "Electrical signalling systems." Electrical Research Products, Inc. October 23rd, 1930. (Addition to 312338.) (390542.)

28473. "Electrical signalling systems." Automatic Electric Co., Ltd. October 13th, 1930. (390546.)

30575. "Electric storage cookers." General Electric Co., Ltd., O. W. Humphreys, and C. W. Stopford. November 4th, 1931. (390557.)

32426. "Electric power converting apparatus." British Thomson-Houston Co., Ltd. November 21st, 1930. (390562.)

33164. "System of electrical picture transmissions." Television Laboratories, Ltd. December 4th, 1930. (390565.)

34067. "Electric cables." A. W. Williams. December 8th, 1931. (390571.)

34147. "Systems for controlling the operation of railway points, signals, and the like." British Power Railway Signal Co., Ltd., Siemens & General Electric Railway Signal Co., Ltd., S. L. Glenn, and F. Horler. December 9th, 1931. (390572.)

1932

372. "Sealing of electric current conductors into quartz vessels." Jenaer Glaswerk Schott & Gen. January 8th, 1931. (390583.)

460. "Telephone receivers and loud speakers." F. W. Lanchester. January 7th, 1932. (390584.)

2986. "Beacons for aerial navigation or the like." General Electric Co., Ltd., J. M. Waldram, and G. H. Wilson. February 1st, 1932. (390600.)

4882. "Means for mounting electric connectors and other fittings in insulators." W. T. Henley's Telegraph Works Co., Ltd., and W. H. Nichols. February 18th, 1932. (390612.)

5817. "Suspension of electric motors in railway and like vehicles." G. Spencer, Moulton & Co., Ltd., and R. T. Glascondine. February 26th, 1932. (390615.)

6121. "Eddy-current electric motors for talking machines." R. Bosch Akt.-Ges. March 16th, 1931. (390618.)

7328. "Regulating device for searchlight arc lamps." Siemens-Schuckertwerke Akt.-Ges. March 11th, 1931. (390624.)

7380. "Alternating current electro-motors." G. Blechschmidt and J. Grunwald. March 11th, 1932. (390626.)

8236. "Electric condensers and the manufacture thereof." International General Electric Co., Inc. March 19th, 1931. (390629.)

8424. "Timing apparatus for switching off and on electric lights for motor cars or other purposes." M. Sillane. March 22nd, 1932. (390630.)

11293. "Systems for indicating the position of hits on targets electrically." W. Moser. April 25th, 1931. (390645.)

11328. "Electrolytic cells." D. J. Evans. April 20th, 1932. (390647.)

13310. "Electrodes of alkaline-type electric accumulators." Ionic Alkaline Batteries, Ltd., and C. J. Berg. May 9th, 1932. (390659.)

15885. "Excess current electric switches." Stotz-Kontakt Ges. June 18th, 1931. (390670.)

18262. "Electrical musical instruments." J. Halmagyl and N. Lager. June 28th, 1932. (390678.)

19275. "Amplifier circuit arrangements employing space discharge amplifier devices." Marconi's Wireless Telegraph Co., Ltd. July 7th, 1931. (390688.)

20536. "Electric heating of kettles, saucepans, or the like." L. St. Alphonse. September 6th, 1932. (390693.)

21564. "Alternating current motors for television and like apparatus." Suddeutsche Telefon-apparate Kabel und Drahtwerke Akt. Ges. Tekade. July 30th, 1931. (390699.)

24421. "Electric liquid heating arrangements." P. J. Robinson. September 1st, 1932. (390715.)

24807. "Electrically operated vacuum and brush cleaners." R. Bass. August 5th, 1932. (390719.)

26014. "Method of igniting an electric discharge tube." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 25th, 1931. (390729.)

27778. "Electric flat irons." P. Lamy. December 12th, 1931. (390738.)

27955. "Electric incandescent lamps." General Electric Co., Ltd. January 15th, 1932. (390740.)

29662. "Method of and apparatus for reducing the contact drop between current-carrying elements." Westinghouse Electric & Manufacturing Co. December 1st, 1931. (390754.)

32769. "Simultaneous starting and parallel operation of two or more rectifiers." Soc. Anon. Hewittic and M. Demont-vignier. December 23rd, 1931. (390771.)

33668. "Electrical systems for controlling temperature." British Thomson-Houston Co., Ltd. November 30th, 1931. (39076.)

1933

1954. "Telephone or like signalling systems." Siemens & Halske Akt.-Ges. January 20th, 1932. (390786.)

2421. "Electric discharge lamps." General Electric Co., Ltd. February 22nd, 1932. (390787.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 26th :—

Quadradyne. No. 539286. Class 8. Instruments and apparatus and parts thereof for use in radio-telegraphy and telephony.—Regentone, Ltd., Worple Road, Isleworth, Middlesex.

Tri-Spot (lettering and design). No. 537233. Class 8. Radio and television transmitting and receiving apparatus and parts thereof, thermionic valves, loud speakers, telephones, electric dry cells and accumulators (not for medical purposes), radio receiving apparatus, &c.—British Blue Spot Co., Ltd., 94-96, Rosoman Street, Rosebery Avenue, E.C.1.

Invicta. No. 340056. Class 8. Time switches.—A. Vandam & Co. (1933), Ltd., Caxton House, Tothill Street, Westminster, S.W.1.

Mickey Mouse. No. 540070, and Minnie Mouse. No. 540071. Class 8. Electrically illuminated advertising signs.—Ionlite, Ltd., 89, Scrubs Lane, N.W.10.

Philora. No. 537622. Class 13. Metal goods.—Philips' Gloeilampen Fabriek Maatschappij. Eidhoven, Holland. (British representatives, Dicker, Pollak & Mercer, 20-23, Holborn, E.C.1.)

Small Canadian Water-power Plants

ELECTRICAL development in the fertile Okanagan Valley, British Columbia, is making rapid progress, power being supplied over the network of transmission lines owned by the Western Canadian Hydro-Electric Company, having its source at the Shuswap Falls. Fruit growing is the chief industry of the Valley, although lumber is also important, and, together with mills, packing plants, and cold storage warehouses, they are the chief industrial outlets for electrical energy. Electrification of a large number of farms has also been proceeded with since the development of cheap electric power. One of the most important uses of electricity is for irrigation.

Many of the small towns were served by municipally owned Diesel-electric plants, of from 100 to 1,000 kW individual capacity. An unsuccessful proposal that the several undertakings should be enlarged on a co-operative basis led to the West Canadian Hydro-Electric Corporation developing the Shuswap Falls site, at which point the river flows through a deep rock cut, a factor that reduced dam construction to the minimum. The plant was officially opened on June 15th, 1929, and the development now completed has a generating capacity of 4,000 h.p. Sufficient water is available for 10,000 h.p., which can be increased to 20,000 h.p. The Corporation also has prior claim to further water and power rights capable of an ultimate capacity of 28,000 h.p. Power is transmitted at 33,000 V, three-phase, 60 cycles, and distributed at 6,600 and 2,300 V.

Since power in abundance became available throughout this territory, industries have sprung up, and to-day electricity is being supplied to mills, box factories, fruit packing houses, for dehydrating, to cold storage plants, for irrigation, and, in addition, the domestic consumption has increased very rapidly.

The obtaining of an adequate supply of water in the Okanagan Valley had long proved a difficulty. Before the introduction of electrical power, small pumping plant had been placed in operation at Oyama and in the city of Vernon. Later, community pumping units totalling 165 h.p. and capable of delivering about 1,700 gallons of water per minute were installed. These electrically driven pumps will irrigate to the extent of 2½-acre-feet per season. The city of Vernon has installed for domestic purposes a 125-h.p. electric pumping unit at Kalamalka Lake.

The orchards in the Okanagan Valley are all favourably situated near the borders of large lakes, so that installations were made by private owners and also on a co-operative basis. Undoubtedly the development of electrical energy in this territory will react on the quality of the fruit produced.

One of the smaller installations is that which has recently been completed by the Ashcroft Water, Electric, and Improvement Company for the town of Ashcroft, serving the Caribou gold mining district. The new plant is the third to be constructed, the first having been installed in 1897. When, in the autumn of 1931, the new power project on the Bonaparte River was started, the contractors were faced with the difficult task of transporting machinery and materials down the 700-ft. wall of the canyon. They erected a dam of wood with a spillway 37 ft. in length. A steel penstock conveys the water to the wooden stave pipe, which is 4 ft. in diameter and 1,400 ft. long, giving a head of water of 54 ft. A Sampson water turbine is directly connected to a Canadian General Electric generator rated at 150 kVA, 2,300 V, 600 r.p.m. Three-phase power is transmitted on a wooden pole line three miles in length to Ashcroft, and is also carried to a 75-h.p. irrigation pump on the Butte ranch 2½ miles from the town. A Lombard governor has been installed in the plant, making the unit entirely automatic in operation.—F. H. FULLERTON.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick (NORTHUMBERLAND).—Houses (44), Clayport Gardens site; G. Beaty, surveyor and architect.

Banstead.—Extensions, nurses' home, mental hospital (£24,000); L.C.C. architect.

Barking.—Central school clinic; C. J. Dawson, architect, Clock House Chambers.

Bedford.—School extensions (£8,727), with lift, for Harpur Trust Governors; Mattock Bros., builders.

Birkenhead.—Extensions, St. Hugh's Schools; Edmund Kirby & Sons.

Birmingham. — Elementary schools, Ilmington Road (£28,300) and Jervoise Road (£13,600), for E.C.

Bolton.—Houses (40), off Crompton Way; Leigh Bros., Ltd.

Bridlington (YORKS).—Houses (110), South Back Lane Estate; Jaques & Greaves, builders, Doncaster.

Brighton.—Development of Arcade site; T. Garrett & Son, architects. Hospital, Eastern Road; governors of the Sussex Eye Hospital. Concert hall and indoor bowling green (£9,000), and remodelling of the Dome and Corn Exchange (£60,000); borough engineer.

Bristol.—Houses (20), Yatton, Long Ashton; Maynard, Froud & Stevens, architects, St. Stephen's Chambers, Baldwin Street.

Bromsgrove (WORCS).—Methodist church (£4,000); A. Pearce & Son, builders, Bordesley Green.

Bucknall (STAFFS).—Estate development, Abbey Lane; Mr. Withington, builder.

Bursiem.—Houses (20), Rushton Road; Harpfield Estate Co., Ltd.

Chelmsford.—Development of Waterhouse Estate; Burrell & Sharp. Market extensions (£4,850); borough engineer.

Cheltenham.—Houses (35), Hatherley Road; Wheeler & Mansell.

Cleator Moor (CUMBERLAND).—Houses (100); Workmen's Housing Association, Ltd.

Corbridge-on-Tyne.—Extensions, hospital; M. Hogarth & Sons, builders.

Cuckfield.—Casual wards, West Hylands Institution (£4,000); H. Finch, builder, Haywards Heath.

Darlington.—Houses (50), Boyne Street, and elementary school (480 places); E. Minors, borough surveyor.

Dawley.—Houses (38); J. H. T. Hickman, U.D.C. architect, 1, Market Street, Wellington, Salop.

Deal.—School (400 places); H. M. Barker, architect, 37, Queen Street.

Dumfries.—Offices (£3,000), for the Caledonian Omnibus Co.; W. F. Crombie, architect.

Dundee.—Alterations to Craig Street Market (£1,500); city architect.

Durham.—Additions, Easington, Durham, Barnard Castle, and Bishop Auckland Poor Law institutions (£12,000); W. J. Merrett, county surveyor, 43, Old Elvet.

Essex.—Extensions, Hornchurch Institution; J. Stuart, county architect, Chelmsford.

Exeter.—Houses (302), St. Loye's Estate; city architect.

Gateshead-on-Tyne.—Houses (100), Saltwell Road area, for F. W. Hindmarsh; Hetherington & Wilson, architects, County Chambers, Westgate Road, Newcastle.

Gillingham.—Houses (60), Grange Road; A. E. V. Newnham.

Glasgow.—Houses (24), Whitelaw Street; housing director and trade contractors. Shops, Paisley Road West; Lauder & Shaw, Ltd.

Gorleston (NR. GREAT YARMOUTH).—Five shops, Lowestoft Road; D. C. Thomas.

Gosport.—Houses (80), Seafield; borough surveyor.

Great Yarmouth.—Post office; H.M. Office of Works, King Charles Street, S.W.1.

Hanwell.—Extensions, mental hospital (£9,800); L.C.C. architect.

Harrow.—Extensions, College Road; Grange Furnishing Co.

Herne Bay.—Rebuilding, Tower Hall and Café, Tower Parade; Wilbee & Son.

Houghton-le-Spring (DURHAM).—Houses (24); U.D.C. surveyor.

Hull.—Flats (60), Barnsley Street (£15,652), and houses (144), Endyke Lane (£41,952); W. J. Simms, Sons & Cooke, Ltd., Nottingham. Cinema, Ferensway; Col. Wilson, solicitor for syndicate.

Jarrow-on-Tyne.—Houses (108); J. Scott-Weir, borough surveyor, Town Hall.

Kent.—Four schools (1,750 places), Sidcup, and central school, Sandwich; director of education, Maidstone.

Keswick.—Houses (24), for I. & R. Hodgson, builders.

Kincardineshire. — Classrooms at Laurencekirk School (£25,000); county clerk, Laurencekirk.

Kingston-on-Thames.—Municipal offices and courts (£150,000); Sir Aston Webb & Sons, architects.

Lancashire.—School, Garrett Lane and Henfold Lane (electrical installations); S. Wilkinson, county architect, 16, Ribbledale Place, Preston.

Leek.—Houses (60), Haregate Estate; W. E. Beacham, surveyor.

London.—(GREENWICH).—Houses, Blackwall Lane; borough engineer. (PADDINGTON).—Rebuilding, 480-2, Harrow Road; Montague Burton, Ltd. (SOUTHGATE).—Houses (26), Tewkesbury Terrace, Southgate; A. L. Farman, architect. Houses (12), Firs Lane; Geo. Reed & Sons, Ltd. (STOKE NEWINGTON).—Shops and offices, Green Lanes and Seven Sisters Road; Dowton & Co. (WOOD GREEN).—Houses (20), Palace Court Gardens; Leyland Construction Co. Shops and flats, Bounds Green Road; T. P. Bennett & Son.

Longton (NR. STOKE-ON-TRENT).—Houses (100), clearance area; Stoke city engineer.

Mansfield.—Houses (44), Chesterfield Road; A. Farnsworth. Operating and X-ray rooms, Mansfield Hospital, West Hill Drive; governors.

Markinch (FIFE).—Houses (20), with electrical installation; A. P. Haxton, architect, Commercial Road, Leven.

Middlesbrough.—Conversion of "Homewood" mansion into preparatory school (£3,500); S. E. Burgess, borough engineer.

Middlesex.—Technical institute, Twickenham; director of education, 40, Eccleston Square, S.W.

Morecambe.—Church for St. Christopher's, Bare; Austin & Paley. Nurses' home, Queen Victoria Hospital, Old Lancaster Road; governors. Shelters (£6,000); borough engineer.

Newbiggin (NORTHUMBERLAND).—Houses (36) and bungalows (16); R. Carse & Sons, Ltd., builders, Amble.

Newcastle-on-Tyne.—Alterations, Holy Trinity Church, Northumberland Road; A. K. Tasker, architect, Trinity Buildings, New Bridge Street. Extensions to arcade for Messrs. Caller, Northumberland Street; T. Irwin, builders, Strawberry Lane.

Northallerton.—Houses (98), for A. Smith, builder.

Northampton.—Shops, Kettering Road; A. L. & H. W. Chown, builders, Edinburgh Road.

Northern Ireland.—(BELFAST).—Church, Malone Street (£12,000), with electrical installation; Hobart & Heron, architects, 120, Scottish Provident Buildings.

Northolt (MIDDLESEX).—Houses (27), Kingsmead Drive; Grainger Bros., 202, Northolt Road, Harrow.

North Shields.—Houses (14) for Whitelaw, Ltd., Tynemouth Road; W. Stockdale, architect, 73, Howard Street.

Oxford.—Secondary school, Southfield (£29,000), for E.C.

Paignton.—Business premises, Torquay Road; T. Somerville.

Patcham (SUSSEX).—Houses (42), Graham Avenue; T. G. Thompson.

Perth.—Child welfare centre; burgh surveyor.

Peterhead.—Houses; burgh surveyor.

Preston.—Houses (99); A. Threlfall, builder, Leyland.

Prestwick (AYRSHIRE).—Bungalows (£7,800); J. Hay, builder.

Purley.—Swimming bath, 152, Foxley Lane; Sir G. T. Broadbridge.

Ramsgate.—School (200 places), Priory Road; director of education.

Scarborough.—Additions to Falsgrave Council School; H. W. Smith, borough engineer.

Sheffield.—Congregational Church, Valentine Crescent, Shiregreen; Chapman & Jenkinson. Houses (74), Gleadless; A. & E. Tate. Extensions, Queen's Road tram depôt (£26,500); city architect.

Skegness.—Re-erection of business stores, Rainsford Buildings, Drummond Road, for A. L. Swain (£10,000).

Smethwick.—School centre, Waterloo Road (£2,000); borough engineer.

Southend-on-Sea.—School (600 places); H. B. Watson, director of education.

Southport.—Estate development, Cambridge Road; Duncan B. Gray & Partners.

South Shields.—Houses (150), Marsden Road Garden Estate; W. Leech, builder, Couts Road, Newcastle-on-Tyne.

Stanley (DURHAM).—Houses (150), South Stanley; J. T. Trousdale, U.D.C. surveyor.

Stockport.—Houses (20), Lancashire Hill; W. F. Gardner, borough surveyor.

Stockton-on-Tees.—Additions to post office; W. Pearson and Sons, builders, Burn Road, West Hartlepool.

Stoke-on-Trent.—Houses (79), Grove Road (£400 each); Ball & Robinson. Factory extension, Copeland Street; Shorter & Son.

Sunderland.—Additions, Commercial Road Council Schools (£29,000); Gordon Durham, Ltd., builders, East Boldon.

Sutton Coldfield (NR. BIRMINGHAM).—R.C. church, Lichfield Road (£10,750); J. R. Deacon, builder, Lichfield.

Tunstall.—Houses (24), St. Chad's Road; Taylor, Shaw & Bromley. Development of Chell Lodge Estate; T. Yoxall, architect for Mr. Cope.

Twickenham.—Flats, Heath Road; Bierrum & Partners.

Tynemouth.—Houses (216), Ridges Estate; J. L. Beckett, borough engineer, Howard Street, North Shields.

Upton-on-Severn.—Houses (50); Building & Public Works Construction Co., Ltd., builders, Swindon.

Wakefield.—Additions to Star Laundry, Southgate (electrical installation); A. Clifford Green, builders, Market Street.

Wealdstone.—Houses (30), Charlton Road; J. Turner. Swimming bath, Christchurch Avenue (£6,791); W. S. Try, Uxbridge.

Weetslade (NORTHUMBERLAND).—Houses (30) and shops, Annitsford; F. E. Maughan, Hedgefield, Orange Grove, Dudley.

West Bromwich (NEAR BIRMINGHAM).—Factory building, Dartmouth Road; Webb & Sons, builders, Soho Hill, Soho, Birmingham.

West Greenford (MIDDLESEX).—Library (£6,500); W. R. Hicks, council architect, Town Hall.

West Riding.—Schools, Sprotborough and Bentley-with-Arlsey; director of education, Wakefield.

Weymouth.—St. Joseph's R.C. Church (£9,239); W. Lacey, builder, Staines Road, Hounslow.

Whickham (DURHAM).—Houses (79), Northlands Estate; S. J. Stephenson, architect, 2, Saville Place, Newcastle-on-Tyne.

Whitby (YORKS).—Houses (34), Gallows Close Housing Estate; Hays & Gray, architects, Central Chambers, Wingate, Durham.

Willington (DURHAM).—Houses (£4,773); J. Thorne, builder.

Wolverhampton.—School, Bushbury (£5,966), for E.C.; E. Horton & Dalby, builders, Hugglescote, Leicester.

Woodingdean (SUSSEX).—Development of Sunrise Vale Estate; C. Vale.

Worksop.—Library and museum, Watson Road (electric lighting installations); G. Rawson, borough surveyor, Municipal Offices.

York.—Houses (32), Kirkstone Drive; Sherry & Swift. Slipper baths, Salisbury Road (£2,500); city engineer.